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Opportunities in New F.H.A. $50,000 Loan Program . . .

- Effect of N.R.A. Decision
- One Year of the 30-Hour Week
- The Cost to Hang Fixtures
- Adequate Wiring in 1200 Homes
- Profitable Small Motor Repairs
- An Electrical Safety School

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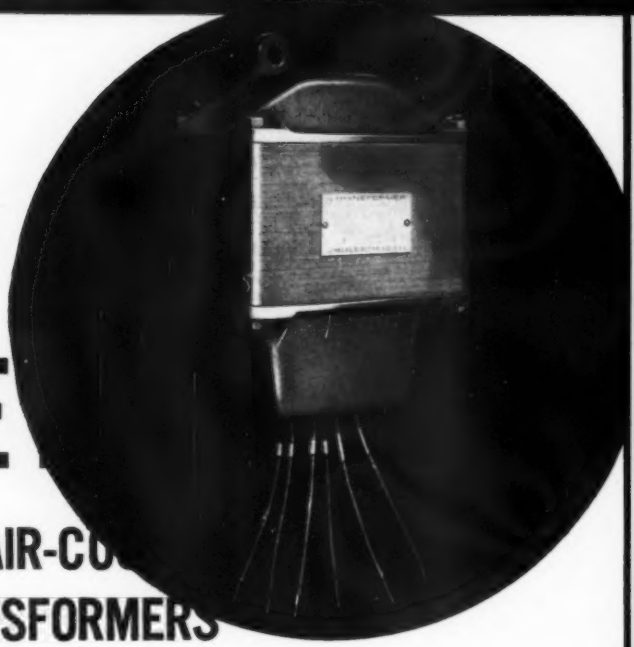

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TRANSFORMERS

HERE is a profit-making type of equipment which is welcomed in industrial plants because it saves money.

These G-E air-cooled transformers provide a means for putting 115-volt power equipment such as small drills, compressors, fans, soldering irons, and gluepots on the higher-voltage power circuits. This means reduced operating expense, where the rate on these power circuits is lower.

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You will find a wide variety of applications for G-E time switches. They will be particularly profitable to you because you will have no expensive service calls to wind clocks, set time, lubricate bearings, and free sticky contacts—G-E time switches are simply constructed for long life, free from petty troubles.

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Start in on the profitable business they offer, by ordering these switches now.

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LET us tell you more about G-E time switches and air-cooled transformers. Simply mail the attached coupon or address the nearest G-E sales office, the G-E Supply Corporation, or the Graybar Electric Company, Incorporated.

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Dept. 6B-201, Schenectady, N. Y.

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Please send me descriptive and application data on the products I have checked above.

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Firm .....

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City .....

320-45

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S. B. WILLIAMS
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ELECTRICAL CONTRACTING

Established 1901
Official Publication
of the
National Electrical
Contractors' Association

INSTALLATION
ENGINEERING
MAINTENANCE
REPAIRING
MANAGEMENT
MARKETING

for

ELECTRICAL CONTRACTORS
INDUSTRIAL
COMMERCIAL
RESIDENTIAL

ELECTRICAL INSPECTORS
ENGINEERS
SERVICE SHOPS

and others engaged in the business of electrical construction

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1,635,829 1,765,000 1,410,790
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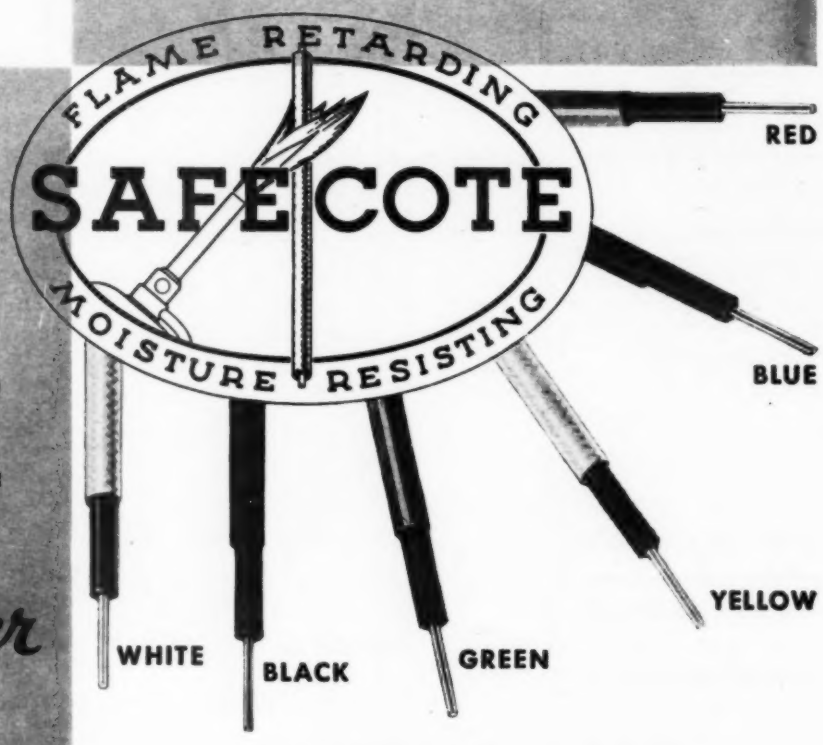
NO WIRE *can be better than its* INSULATION



Wire-life and satisfactory performance depend directly on insulation. And the quality of any insulation rests upon rubber. That is why "U.S." with its vast experience in all fields of rubber development can make better insulation. Why "U.S." Safecote provides the ultimate in wire performance. Made in all sizes, in a variety of colors.

Stocks in All Industrial Centers

1935 is the 25th anniversary of "U.S." Rubber plantations in the Far East. And the crude rubber production of "U.S." is now more than three times the combined output of all other American rubber companies combined. Controlled quality from the actual planting of the rubber tree, bud grafting, tapping and so on down through the various manufacturing operations to the finished product, assures extra value and extra performance for the user.

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EC
JULY 1935

Our Field

FROM time to time, through correspondence or discussion, it has been apparent that not everybody in the industry has thoroughly understood the field that ELECTRICAL CONTRACTING is serving. Partially in explanation, and partially in order that the information might always be available, there now appears on our Contents page a list of the principal types of information covered in this magazine, as well as a list of readers for whom this information is gathered.

ELECTRICAL CONTRACTING is completing its thirty-fourth year, and in all that time has been devoted first and foremost to the interests of the electrical contractor. These interests have gradually expanded, until today the contracting business is much more than that of electrical construction. The advances in installation practice and engineering design of wiring continue, of course, to be major activities for us. In addition, there is the problem of maintaining equipment on installations that they may continue to operate as well as they did when installed. Materials, however, will break down, and it has been found in the main that the service shops of electrical contractors are best equipped to offer quick and economical repair service. All the growing complexities of the contracting business make the problem of management increasingly important, in order that profits might be eked out of competitive prices. And finally, the influx of great numbers of men into the industry, the rapid expansion of electrical application, have not only made selling necessary, but have broadened the market opportunities.

THEREIN lies the field of ELECTRICAL CONTRACTING. Its readers are electrical contractors engaged in industrial, commercial and residential wiring. Because its technical and installation problems are so tied in with inspection, and engineering, ELECTRICAL CONTRACTING also includes among its subscribers electrical inspectors and electrical engineers. Its latest development has been in the direction of electrical equipment service and repairs, so that it now encompasses in its list of readers, service shops to which it offers information on better practices, better management, better economies.

THE policy of ELECTRICAL CONTRACTING shall be to disseminate all of the information it can to improve the engineering installation. repairing and marketing technique of the electrical contracting industry. New processes, approved methods, successful selling plans, new markets, reinspection, safety, better tools, better workmanship, better industry relations, are some of the fields which ELECTRICAL CONTRACTING will explore.

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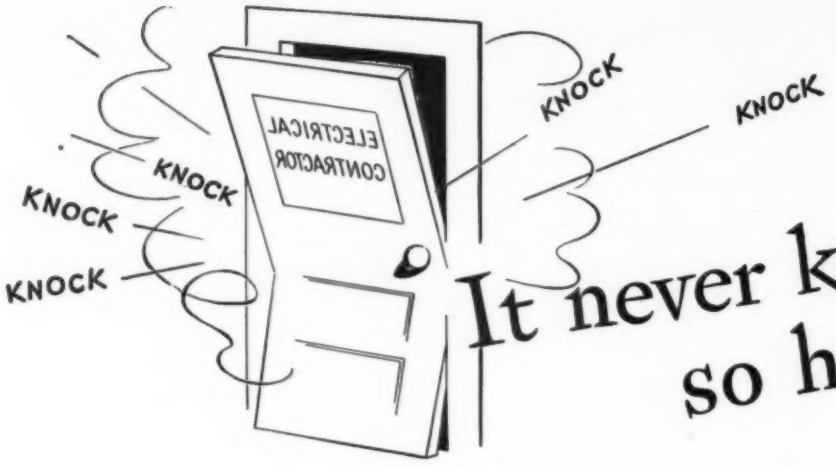

It never knocked so hard!

The U. S. Government has provided the Key

Opportunity is knocking at your office door, Mr. Electrical Contractor—and it means business! Big business—the $6,000,000,000 which it is estimated will be spent by individuals and businesses under the Federal Housing Act.

Question—who is going to get it?

Answer—it can be you!

This business is worthwhile. Uncle Sam's recent amendment raising the limits of approved loans to $50,000 per building for industrial or commercial modernization opens up what is perhaps the largest, most profitable slice of the building field.

Other building trades—mason, carpenter, plumber, roofer—will all go to work to get their share of this $6,000,000,000 opportunity.

Where does the electrical manufacturer, wholesaler and contractor fit in?

It depends on all of us. The manufacturer, the wholesaler and the contractor must all work together if the electrical industry is to get its full share of this opportunity.

We stand ready to do our full share and will plan with you the best ways and means to cooperate in securing this business. A survey of the electrical needs of the factories, stores and office buildings in your city and a definite selling plan to go after this business would prove well worthwhile. Adequate wiring, modern lighting, new motors and control, ventilating equipment and many other electrical items can be sold in real volume under the new Federal Housing Administration ruling. The *need* is there, the *money* to pay for it is there—let's get together and get the business.

Graybar is ready to help, in planning local sales campaigns, in providing folders and other selling tools and in supplying quality electrical equipment when and where you need it.

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ELECTRICAL CONTRACTING

Vol. 34 JULY, 1935 No. 9

▲

S. B. Williams, Editor

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FIELD BRIEFS

● ANOTHER LIGHT COMPANY has discontinued the free renewal of lamps. This time it is the Milwaukee Electric Railway and Light Company, which at the same time announces a reduced residential and rural rate. The local contractors feel that this is a distinct victory as they have opposed free lamp renewals for some time.

● SLUM CLEARANCE projects are to be all electric, with electric cooking, refrigeration and lighting for each apartment. Although only a few electrical contractors can participate in these projects, they should stimulate a demand for similar electrical apartments elsewhere.

● APPROXIMATELY 18,000 ranges have been wired by contractors in the Philadelphia area during the past three years. Three contractors nearest to each new range installation are invited to bid upon job specifications that are prepared by members of the Electric Association field staff. These specifications define the construction of the house, lengths of service and feeder runs, and a description of the existing wiring that must be connected into the new service. Plumbing work that may be required for electric water heaters is sublet by the electrical contractor as a part of his job.

● WHILE OTHERS are talking about lower wage rates, the union electricians of Baltimore on July 15 will have their wages advanced from $1.00 per hour to $1.65 per hour.

● SENIORS in the South Philadelphia High School are not only instructed in the use, but also the hazards of electricity. Among the experiments that are implanted in their minds, is that of backing fuses with pennies. The experiment, which, incidentally, was pictured in one of the newspapers, invariably results in a fire in the wires supplying the fuse.

● A STATE LICENSING and inspection bill has been enacted in Michigan, which provides that wiring must be inspected and a certificate must be issued before a light company can connect. This raises a problem in the areas not provided with inspectors.

● AN EDUCATIONAL film on fire, showing electrical fire hazards among others, is now available for showings in schools and before social and civic groups. This film, available both in sound and silent version, comes just at the time the Safety in the Home Movement of the electrical inspectors is taking root. The film is owned by Aetna Life Insurance Company.

● THE SEVERAL VILLAGES in Westchester, N. Y., have reciprocal licensing arrangements whereby a licensed contractor of one community may, for a nominal sum take out a license without examination in another village.

● A SURVEY of the 480 contractors in the five counties controlled by the Harrisburg (Pa.) Electrical Contractors-Dealers Association shows that in a period of ten years only 6 per cent have cooperated to any degree, the remaining 94 per cent of the contractors doing nothing to improve the industry. This is the first time we have seen such figures developed for any community, but the chances are that they are not far from the average.

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Contracting Industry

Supreme Court NRA decision finds industry without plan or program waiting for leadership

FOR thirteen months the electrical contracting industry had been subject to a code of fair competition when the decision of the Supreme Court of the United States invalidating all Codes under the National Recovery Act was handed down. What would be the effect of that decision upon the electrical contracting industry? Would it go back to its former unsatisfactory competitive practices? Was there anything in the Code that should or could be retained, and was it posible for the industry voluntarily to operate under a code?

These were questions that occupied the minds of the more thoughtful people of the industry. To get the answers to these questions, ELECTRICAL CONTRACTING sent a questionnaire to more than four hundred chairmen of local, district and regional committees. From the response the following résumé was prepared.

1. What has been the effect on the electrical contracting industry of the ruling of the Supreme Court invalidating N.R.A. Codes?

For the most part there has been no change; but that, in great measure, is probably due to the shortness of time that has elapsed between the ruling and the report. In many localities the volume of work was reported to be too small to permit any change to become apparent. In a number of places the ruling of the Supreme Court brought great disappointment because the administration of the Code was being perfected, and the benefits becoming greater all the time. Elsewhere, however, the ruling brought an expression of relief. This is particularly true of those communities where a few of the better contractors were trying to uphold the Code, while a large number of very small units were not abiding by the regulations. Reports from some other places frankly admitted that the decision made no difference because the Code had not worked anyway.

2. Are Code hours and wages being maintained since the decision? If not, what is happening?

In general the hours and wages have been maintained. Of course, where union agreements exist there has been no change. In most cities, in fact, there seems to be a decided inclination to uphold the hours and wages provision of the Code. While there have been some vicious slashes, such as one reported from Miami, where immediately upon the decision, the men on a hotel job were notified that their wages had been cut from $1.25 to 60 cents per hour for journeymen and 30 cents for helpers, the departures for the most part have been in the nature of increasing the hours.

3. Have bidding practice evils returned? In what way?

There seems to be no question but what the evils of the past are back. While some cities did report that the bidding evils had not returned, they were in the minority. The worst practice at the moment seems to be bid peddling. The general contracors apparently were just waiting for the Codes to be charged illegal, when they unleashed all their former practices. It is apparent from the reports, that they found a willing and complaisant group of electrical contractors on which to operate. It is interesting to note from the reports that a number of cases stated that the Code had never been able to effect a change in bidding practices.

4. What provisions of the Electrical Contractors Code brought the greatest benefits to your industry?

While many could give no benefits that they received from the Code, the majority expressed the opinion that the bid depository practice should be kept. Next in importance came hours and wages, and next to that came bidding practices. In some of the comments, however, it was interesting to note the emphasis that was placed upon the affect of association gained through Code operations. The mere fact that contractors were thrown together to operate in a certain way

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Back in Old Competitive Rut

seems to have brought about a better relationship. The matter of industry education was also stressed as being of value.

5. What features of the Electrical Contractors Code do you believe can be carried out by voluntary action of the industry without government policing? Through what means can the electrical contracting industry do its own policing?

With one or two exceptions, the answer came back strongly that there was no feature of the Code that the industry could save by voluntary action without Government help and policing. The chairmen of the enforcement committees were clearly of one opinion that the electrical contractors could enforce no agreements without the aid of some outside policing force. Opinions were expressed that the State might help do the policing, or that wholesalers, or organized labor might be used through some kind of joint agreement. There was little thought that much reliance could be placed upon the Federal Government for policing, because that power had been found wanting under the Code. In one instance, namely, Youngstown, Ohio, the exception stands out. There a code of fair competition had been in operation before N.R.A., and had demonstrated that such voluntary agreements could be made to work without the aid of outside policing.

6. What steps, if any, are being taken by your local electrical contracting industry to retain the benefits of the Code?

In a great many instances the local association has called its members together for the purpose of finding some way to retain the benefits of the Code. For the most part, however, these meetings have not been very productive, because there was either a difference of opinion or because the men knew so little what they wanted, or what could be accomplished. In a number of instances, members of an association have agreed to abide by the rules of the N.R.A. Code, but as one man expressed it, "It depends on how long the fellows can stand the competition without getting hurt too much."

All in all, this survey has disclosed some interesting facts. It is quite apparent from the letters to the questionnaire, that the administrators of the Codes had a lot of grief in trying to secure compliance. It was brought out definitely that compliance, for the most part, was secured without the aid of the Federal Government. It was shown that it is virtually impossible to secure compliance from very small operators, and particularly where they are scattered.

It was evident, however, that in spite of the trouble and the grief, the industry generally was beginning to secure certain definite benefits from the Code, and was looking about for some way to retain those benefits. Attempts have been made to set up local associations, state associations have been organized, and little groups have come together for the signing of agreements. For the most part, however, no very definite plans have been formed. It appears as though the local industry is waiting for someone to show the way. It is apparent from the letters that if a way can be found that offers some hope, it will be accepted by a large number of communities. As one man expressed it:

"We regret that it was necessary to abolish the National Electrical Contractors Code, and we are hopeful that some substitute will be enacted to take its place, as the electrical contractors code committee of this area were in full accord with the entire Code, and we stand ready to assist the National Electrical Contractors Association in executing any code of fair practice that may be enacted."

Another chairman makes this comment:

"If it were legally possible to set up a local industry court that would be empowered to suspend or cancel a contractor's license, or cut off his source of supply after he had been regularly found guilty of intentional violation, I believe such a plan would be very effective. The mere fact that such compliance authority existed, and that there would be no delay in applying the penalty, would be sufficient to cause the slippery inclined boys to go straight. Such a plan may be visionary and illegal, but perhaps it is worth a lot."

Another writes:

"Our local electrical contractors' group have agreed to continue to comply with the majority of the Code provisions, as long as it is possible for them to do so without having all of their business taken away from them by the few who will not agree.

"I feel that the next step is a complete organization of local associations, state associations, regional councils or committees, so as to enable the proper functioning of the N.E.C.A. Many of the problems of the industry can be handled by these groups which it is impossible to handle through the National. Local and regional problems are too numerous to be handled in any other manner than by local and regional groups of contractors."

Some of the other comments were interesting. One pointed out that the successful contractors are usually the ones who operate in the most ethical manner. Another laid great stress upon the great necessity for eliminating the contractor-jobbers. Another one asked about the former Federal Trade Commission trade practice rules.

While, in many instances, the time that had elapsed after the decision was too short for changes to develop, or there was insufficient work to permit any changes to occur, the above summarizes the situation. There is running through the industry the hope of retaining some of the benefits of the Code, but at the same time, there is no plan, no program. The industry appears to be waiting for leadership.

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New $50,000 F.H.A. Loan Limit Offers

Industrial and Commercial Modernization Opportunities

MODERNIZATION credit has been increased from $2,000 to $50,000, for industrial and commercial properties, as the result of an amendment to the Federal Housing Act. Such loans may cover, with or without structural changes, the purchase and installation of machinery and equipment "peculiarly adapted to the business conducted therein or necessary to the operation thereof."

Such modernization loans may be insured up to 20 per cent. Interest may be any rate the lending institution desires to charge, except that it may not exceed the equivalent of $5.00 discount per $100 for one year. The loan is to be paid in equal monthly installments for a period not to exceed five years.

Loans under the new $50,000 limit are available for repair, alteration, or improvement of all property already improved or to be converted into apartment or multiple family houses, hotels, office, business or other commercial buildings, hospitals, orphanages, colleges, schools or manufacturing or industrial plants. The limit for home modernization loans remains at $2,000.

Loans may now be secured from the same lending institutions that have been loaning under the F.H.A. home modernization plan. The money is not loaned by F.H.A., but only insured by that agency.

The policy that will guide the acceptance of applications for these loans will be the extent to which the improvements or new equipment will make it possible to increase the profitableness of the business. It is anticipated that in most instances the benefits derived from the expenditure will be greater than the loan, thereby making it self-liquidating.

In addition to the electrical work that will come from general structural alteration, this credit plan opens up new opportunities for the electrical contractor.

During the last few years, a number of industrial electrical contractors have financed modernization installations on the basis of payment to be made as benefits were earned. While this new F.H.A. credit plan will not take up such work already completed, it should no longer be necessary for the contractor to finance such work for his customers.

The plan fits in well with the Better Light-Better Sight Campaign. Already one large manufacturer of commercial lighting equipment, in cooperation with a plate glass manufacturer is making a drive on the modernization of store fronts and windows. Almost every type of building that comes under the plan opens opportunities for improved lighting.

Air conditioning in the smaller stores and restaurants can be financed under this plan. So far the market belongs to anybody who will go after it. Each installation involves considerable electrical work.

Sound and signal systems for commercial and industrial applications can be sold under this plan.

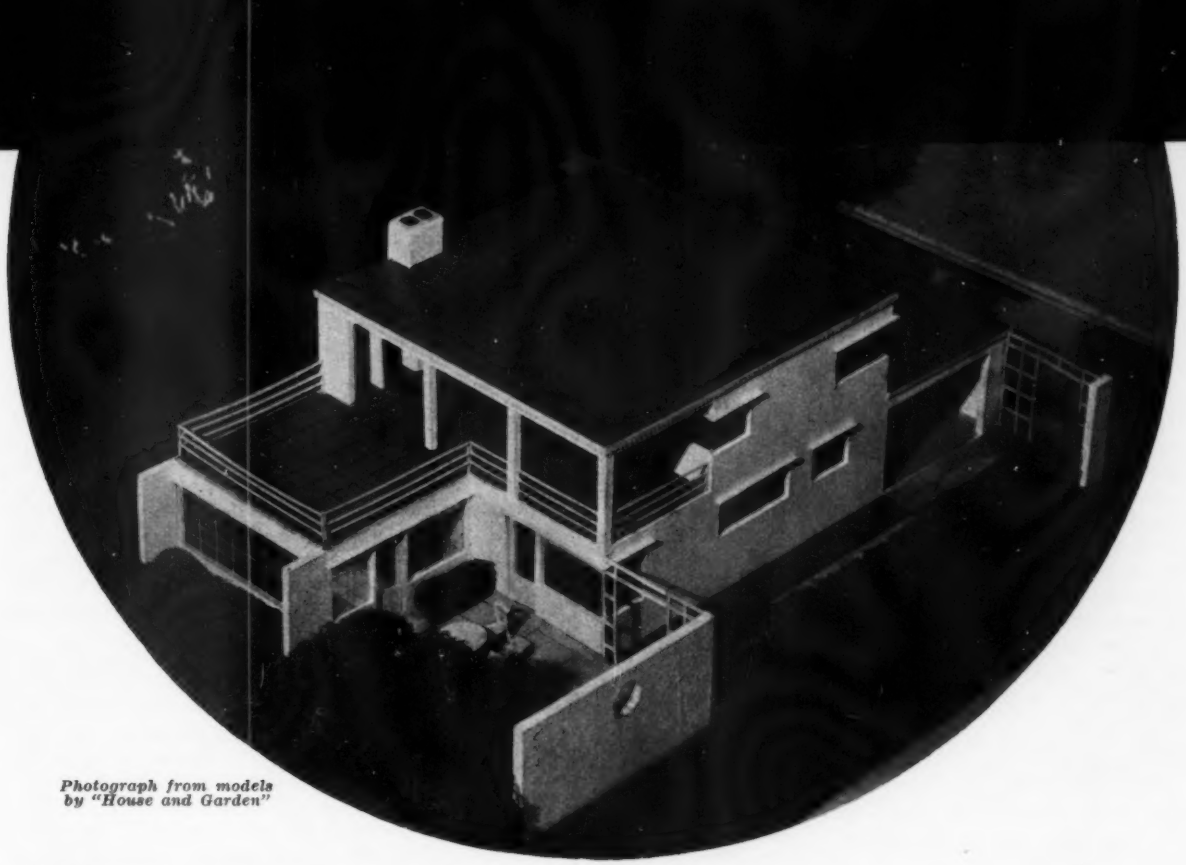
One of the handicaps to the promotion of reinspection has been the lack of money or financing. In every city there is a vast quantity of defective wiring that should be corrected. The burden on the individual owner is not great when the cost can be spread over a few years.

Most filling stations need rewiring with explosion-proof equipment. At the same time they can increase their amount of outdoor lighting.

The number of ways in which industrial modernization can be effected are too many to enumerate. There are the revisions that will give the customer the benefit of a better power rate; there are corrections to the motoring to improve the power factor; there are replacements of old equipment to provide greater speed or flexibility; there are the newer motors of special application that ensure greater continuity of operation; there is general rewiring to cut down losses and improve safety.

Since the slogan of the plan is "Modernization for Profit," the electrical contractor is afforded an opportunity for selling by showing the benefits to be derived from modernizing now, and making the changes self-liquidating.

Incidentally, it should be obvious from the $50,000 limitation that the plan was designed not for the larger concern, but for the smaller independent operator who cannot finance himself with stocks or bonds.



Photograph from models by "House and Garden"

Wiring the Grand Prize "New American" House

Adequacy, decentralized distribution and radial circuiting characterize layouts for 1,200 "New American" homes to be built this year

THE first group of an anticipated 1,200 "New American" modern homes went under construction in various localities on June 15, under the sponsorship of the General Electric Company. The plans used for building these homes were selected from among 2,000 sets of drawings submitted in the recent General Electric architectural competition. Many of these homes are expected to be ready for showing by September 1. This "American Home" program is expected to provide at least one such house for each 100,000 population. The extensive publicity program which is being conducted will arouse widespread public interest, and is expected to provide a stimulus to home building revival.

From an industry standpoint these homes will provide a nation-wide display of electrical adequacy in small model home designs. In addition to publicity, this plan, which is basically a cooperative one, provides for liberal credit to be extended by the General Electric Company, covering the sale of basic electrical equipment involved. All homes constructed under the "New American" house program must conform to

FIRST FLOOR PLAN

Circuit "A"—from Service Equipment #1 to Electric Range #3. Electric water heater is to be placed on same circuit as the electric range, to be controlled by Automatic Peak Limiter, Cat. Y-121.

Circuit "C"—from Service Equipment #1 to 20 Ampere Circuit Breaker* #4.

Sub-circuit C1—from #4 to #5.
Sub-circuit C2—from #4 to #6.
Sub-circuit C3—from #4 to #7.
Sub-circuit C4—from #4 to #8.
Sub-circuit C5—from #4 to #9.
Sub-circuit C6—from #4 to #10.
Sub-circuit C7—from #4 to #34.

4 20 Amp. single pole Circuit Breaker*—Cat. GB-120 to be mounted in Gang Outlet Box with #31 and Brass Plate.
5 Convenience outlet GE-2679.
6 Convenience outlet GE-2679.
7 Convenience outlet GE-2679.
8 Convenience outlet GE-2679.
9 Convenience outlet GE-2679.
10 Convenience outlet GE-2679.
11 15 Amp. single pole Circuit Breaker*—GB-115 to be mounted in Gang Outlet Box with #4 and Brass Plate.
12 Ceiling light in garage.
13 Side wall outlet in garage.
14 Side wall outlet in garage.
15 3 way Switch GE-2515 controls ceiling outlet #12—GE-2514.
15A 4 Way Switch GE-2515.
16 (2) 3 way Switches GE-2911 one to control ceiling light #12, other to control ceiling light #27.
17 Single pole Switch GE-2641 controls outside wall bracket #18.
18 Outside wall bracket.
19 Side wall outlet for house number.
20 (1) single pole Switch and
21 (1) 3 way Switch or combination GE-2909—#20 to control outside fixture #22 and #21 to control #23 and #24A ceiling fixture.
22 Outside bracket.
23 Ceiling fixture.
24 (2) 3 way Switches GE-2911, #24 to control A ceiling light #23 and #24A and #113 to 113 control ceiling light #112.
25 4 way Switch GE-2515 controls ceiling light #27.
26 Same as #16 above.
27 Ceiling light
27A Fan

Circuit "D"—from Service Equipment #1 to 15 Ampere Circuit Breaker* #11.

Sub-circuit D1—from #11 includes #12-13-14-15-15A-16-17-18-71-72.
Sub-circuit D2—from #11 includes #19-20-21-22-23-24-24A.
Sub-circuit D3 from #11 includes #25-26-27-28-29-30-31-31A-32-33-33A-27A.
Sub-circuit D4 from #11 includes #124-125-126-127-128-129-130-131.

28 (1) 3 way and (1) single pole Switch GE-2909, #28 controls ceiling light #27 and
29 #29 controls ceiling light #30.
30 Ceiling light.
31 Single pole Switch GE-2641 controls side wall fixture #32.
33A Clock outlet GE-2042.
32 Side wall fixture.
33 Single pole Switch controls #33A side wall ceiling outlet.
33A Side wall outlet.
34 Combination convenience outlet and wall bracket.
35 Circuit Breaker* 20 Amp. single pole GB-120 to be mounted in Gang Outlet Box with #56 and Brass Plate.
36 Twin convenience outlet GE-2679.
37 Twin convenience outlet GE-2679.
38 Twin convenience outlet GE-2679.
39 Convenience outlet GE-2959.
40 20 Amp. single pole Switch GE-2643 to control one side of convenience outlet GE-2901, #43 to #47 inclusive.
41
42
47 (inclusive)—GE-2901 Convenience outlets, one side to be controlled by Switch #40 and other side to be directly on an uninterrupted circuit.
48 Convenience outlet GE-2679.
49 Convenience outlet GE-2679.
50 Convenience outlet GE-2679.
51 Convenience outlet GE-2679.
52 Convenience outlet GE-2679.
53 Convenience outlet GE-2679.
54 Convenience outlet GE-2679.
55 Convenience outlet GE-2679.

Circuit "E"—from Service Equipment #1 to 20 Ampere Circuit Breaker* #35.

Sub-circuit E1 from #35 includes #36-37-38-39-55.
Sub-circuit E2 from #35 includes #40-41-42-43-44-45-46-47.
Sub-circuit E3 from #35 includes #48-49-50-51-52-53-54.

Circuit "F"—from Service Equipment #1 to 15 Ampere Circuit Breaker* #56.

Sub-circuit F1 from #56 includes #57-58-59-60-61-62.
Sub-circuit F2 from #56 includes #63-64-65.
Sub-circuit F3 from #56 includes #66-67-68-69-70-132-133-134-135-136-137-138-139-140.

56 15 Amp. single pole Circuit Breaker—GB-115 to be mounted in Gang Outlet Box with #35 and Brass Plate.
57 3 way Switch GE-2514 controls #58 ceiling light.
58 Ceiling light.
59 Same as #57 above.
60 3 way Switch controls #61 outdoor wall bracket.
61 Outdoor wall bracket.
62 Same as #60 above.
63 Single pole Switch GE-2641 controls #64 and #65 ceiling lights.
64* Ceiling light.
65 Ceiling light.
66 (2) single pole combination Switches GE-2907 #66 to control wall brackets #67 and #68.
67 Wall bracket.
68 Wall bracket.
69 Same as #66 except to control #70 ceiling fixture.
132 Single pole door Switch* GE-275 controls #133 ceiling light.
133 Ceiling light.
134 3 way Switch GE-2514 controls #135 ceiling light.
135 Ceiling light.
136 3 way and single pole combination Switch GE-2907 #136 controls #137 ceiling light and #137.
137 Controls #136 ceiling light.
138 Ceiling light.
139 Door Switch GE-275 controls ceiling light #140.
140 Ceiling light.

* An alternate to Circuit Breaker shall be Trumbull Electric Company's Enclosed Branch Circuit Residence Panel, 3 wire 4 circuit, Cat. 4104.

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definite plans and specifications which are already available. These contemplate the complete use of wiring materials, equipment and appliance of General Electric manufacture.

The particular design presented in this article is for the smaller grand prize home. This particular design has a total cubage of 19,984 cu.ft. It therefore provides an opportunity for a close-up appraisal of what has been done electrically in such a modest-sized unit. Complete air conditioning, electrical cooking and water heating are provided for, plus a generous outlet and switching plan, and an electric kitchen. There are about one hundred and forty 110-volt outlets, ninety-two current consuming and forty-eight wall and door switches. In addition there are low voltage signals, controls, radio, etc. This detailed electrical design was prepared in the General Electric organization by its various departmental engineering staffs.

A minimum standard applicable to all these homes requires at least No. 4 service conductors, a No. 8 combination range and water heater circuit, and No. 12 branch circuits. New principles of feeder and load-center design have been introduced, as well as a radial or sub-circuit outlet grouping method.

A Plan That Specifies

In developing the electrical drawings, each 110-volt outlet, whether current-consuming or switch control, has been numbered upon the floor plan. Each sheet of the floor plan includes a descriptive schedule of all these numbered outlets in consecutive order. It will be noted that the General Electric catalog number of each wiring device is thus definitely established for each item beyond question of doubt, either as to function, grade or quantity. Above the individual description of outlets are listed the specific sub-circuits upon which the outlets are to be grouped, and also to which circuit breaker these sub-circuits are to be routed.

The foregoing method was chosen as an aid to those having the responsibility of checking the detailed requirements for this wiring system, whether in estimating, installation or during inspection.

Certain outlet or switching preferences that are common or only applicable to various sections of the country, will not all be found provided for. In nearly all cases, such features may easily be added locally if found especially desirable. Such omissions are: Front door chimes, protective lighting, bathroom heaters, dining room floor outlet, house two-way control of garage driveway light, basement stair pilot light, basement cold room pilot, illuminated house number control switch (instead of small continuous-duty bulb), front yard decorative lighting outlet, and kitchen exhaust fan wall switch. Some unavoidable oversights or errors may be noticed on the plans. Since these were already widely distributed in completed form, a correction for this publication was deemed inadvisable at such an advanced stage of general operations.

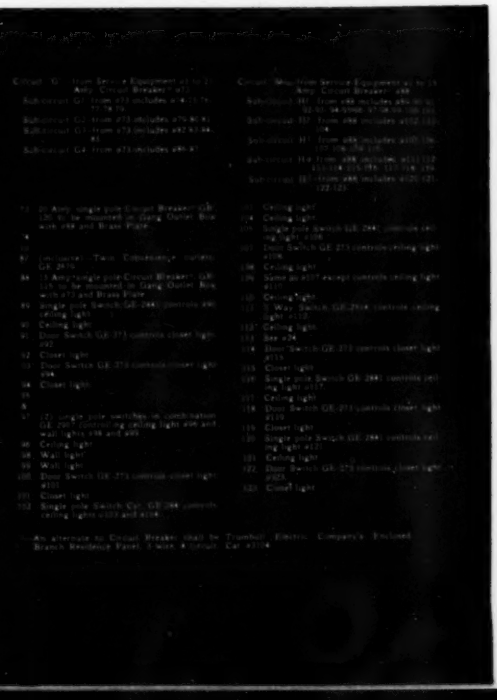
Since the program for the "New American" home is to be nation-wide, under varied climates, methods of heating, service facilities, rate bases, and general residence wiring practice, a broad specification was needed that would also cover various choices of house plans. There are also eighteen different house plans available, and each has its electrical plan and specification.

Specifications were prepared which require that all work be installed in accordance with the National Electrical Code, and as approved by the local inspection bureau. They encompass a choice of any approved wiring methods governing similar houses in a given locality for which General Electric materials are available. The same latitude was written into the materials required for services and meter service equipment, so as to cover underground services as well as overhead. The types of outlet boxes, fittings, circuit breakers, panelboards, device plates, and all other items that are not specifically numbered upon the drawings, have likewise been given General Electric identification. The fixture specifications are not included at this time, but an allowance is required to be made by the electrical contractor to cover their cost. A recommended list of twenty-five General Electric portable appliances is included in the general specifications.

De-Centralized Distribution

The conventional panelboard and feeder layout has given way in the "New American" homes, to a system of feeder taps which connect to flush branch circuit breakers at various load-center locations in the house. Thus branch circuit panelboards, their sub-feeders, and the usual feeder distribution panel at the meter-service equipment center are dispensed with. A new system of de-centralized distribution is proposed which warrants close study and analysis.

Based on section 806-d, paragraph 3, of the National



Electrical Code, No. 10 conductors are connected to the main fuses which protect the No. 4 service conductors at the meter board. These No. 10 tap feeders, which are limited to not over 25 ft. in length by the foregoing Code rule, terminate at breakers protecting 15 amp. lighting, and 20 amp. receptacle branch circuits. From each circuit breaker, the branch circuits are divided into from three to seven separate radial runs of two No. 12 wires. While such various runs as connect to one breaker are actually one branch circuit, these separate radial runs have been termed sub-circuits.

Radial Circuiting

The accompanying schematic diagram shows the approximate placing of breakers in pairs, on the first floor and on the second floor. This diagram indicates three No. 10 wires feeding each pair of breakers, after these feeders have been tapped within the service switch cabinet. It will be noted that there is no feeder distribution panelboard in the basement, because, as stated above, the No. 10 conductors which feed the lighting and receptacle circuit breakers, are dependent upon the main service fuses for overcurrent protection. An air conditioning control panel, from which the motor circuit and several 110-volt and low voltage runs are taken to the air conditioning equipment, is likewise fed with No. 10 wire. The only sub-feeder which is fused at the meter board supplies the range and water heater. A limiter device in the water heater circuit prevents its use while the range is in full operation.

Further study of the schematic diagram discloses the use of 15 amp. and 20 amp. branch circuits for serving more than twelve outlets per circuit. It will be noted that section 2010-a of the 1933 Code, permits more than twelve residence outlets per circuit, provided that in addition to any appliance branch circuits, at least one 15-amp. branch circuit is installed for each 500 sq.ft. of floor area. The layout provides five branch circuits in addition to an appliance circuit, for an area of about 1,900 sq.ft.

An alternate has been included in the layouts that permits the substitution of 4-circuit plug fuse type residence panels in case the flush circuit breakers are not used. The use of panels for separately fusing the various sub-circuits would result in a total of twenty-two partially loaded branch circuits, instead of six, under the circuit breaker protection plan.

The standard electrical drawings and output schedules on the preceding pages show the circuit breaker locations centered to minimize all circuit lengths. Likewise the convenience outlets have nearly all been circuited separately from the lighting outlets. The extent that this combination of tapped-feeders and radial sub-circuits has increased material quantities and labor costs has not been estimated in comparison with a conventional panelboard layout. However, any increase in cost that is incurred must be evaluated in relation to the improvement which is brought about in outlet voltages under future load demands.

The sub-circulating of branch circuits into radial runs may offer a further advantage if any remodeling, alterations or additions should occur at some future time. The problem of breaking into a limited sub-circuit, and its re-routing or extension should prove more simple than where a long and circuitous concealed run must be re-vamped to suit changes.

Circuiting Problems

Three major issues confront this principle in designing residential wiring: (1) Local limitations of the Code as regards connecting more than twelve outlets to one branch circuit. (2) The unprotected tap-feeder, if permitted, may be held strictly to a 25 ft. run. This condition may be found awkward in certain house designs, and where the service equipment is located at a remote point in the basement. (3) Services which require larger than No. 4's could not be tapped with No. 10's. Since No. 10, rated at 25 amps. is less than one-third the rated capacity of No. 2, (90 amps.), or No. 1, (100 amps.), such a service would require a slightly modified but not expensive design. No. 8's could be tapped to either of the above sizes, or instead of increasing the tap feeders to No. 8, a 60-amp. sub-fuse at the meter board, in multiple with the range water heater sub-fuse would lower the protective device rating to where the No. 10's would again be permissible. If, with this latter layout, another sub-fuse were provided for the air conditioner panel, the system would then be ideally separated to permit the emergency isolation of (1) cooking, (2) air conditioning, or (3) lighting. For localities where separate rate inducements are available on particular types of load, the latter subdivision would enable full advantage to be taken of all these inducements.

The reduction of voltage loss and the diversity of

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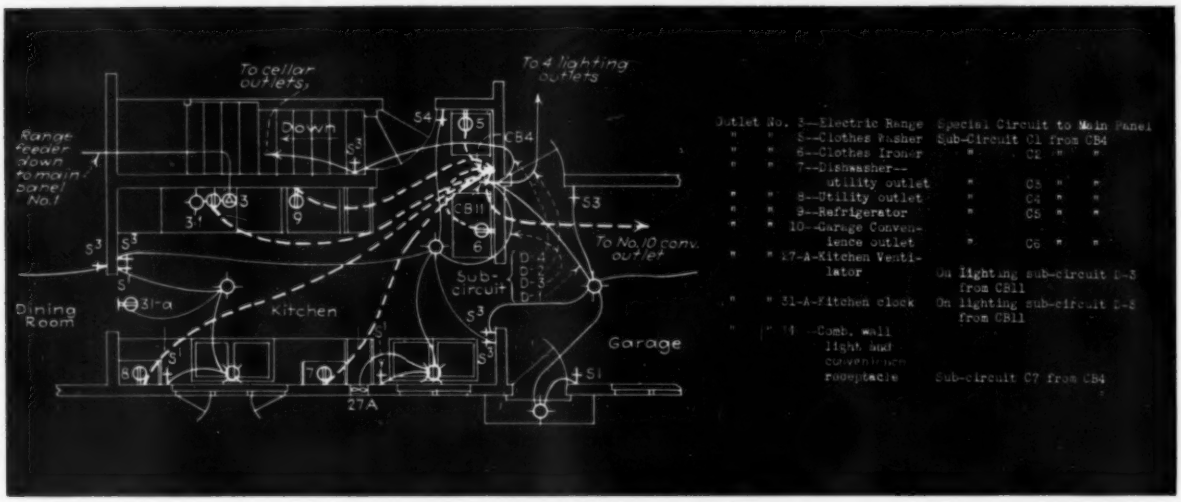

To cellar outlets
To 4 lighting outlets
Range feeder down to main panel No.1
Down
S4
S5
CB4
CB11
S3
To No.10 conv. outlet
Sub-circuit
D-4
D-3
D-2
D-1
Dining Room
Kitchen
Garage
27A
Outlet No. 3—Electric Range Special Circuit to Main Panel
" " 5—Clothes Washer Sub-Circuit C1 from CB4
" " 6—Clothes Ironer " C2 " "
" " 7—Dishwasher—utility outlet " C3 " "
" " 8—Utility outlet " C4 " "
" " 9—Refrigerator " C5 " "
" " 10—Garage Convenience outlet " C6 " "
" " 27-A-Kitchen Ventilator On lighting sub-circuit D-3 from CB11
" " 31-A-Kitchen clock On lighting sub-circuit D-2 from CB11
" " 34—Comb. wall light and convenience receptacle Sub-circuit C7 from CB4

Radial sub-circuiting in the kitchen

conductor loading involves a new kitchen circuiting design. Seven appliance outlets are protected by one 20-amp. circuit breaker which is served by a No. 10 feeder circuit. Separate runs or sub-circuits, each consisting of No. 12 wires, are fanned out from this breaker to the various appliance outlets, without further over-current protective devices. This radial layout prevents any portion of a No. 12 run from becoming subjected to the load of more than one outlet. The use of this distribution or circuiting method offers a diversity of outlet loading (up to the 20-amp. breaker capacity), without the possibility of voltage losses that might result from inadequate circuit copper.

Since each outlet has been placed on its own run, or sub-circuit of No. 12, which leads back to the breaker, future breaker units may be added for protecting a particular outlet, or group of outlets. For instance, any one of the seven No. 12 runs to appliance outlets could at any time be transferred to a separate additional breaker.

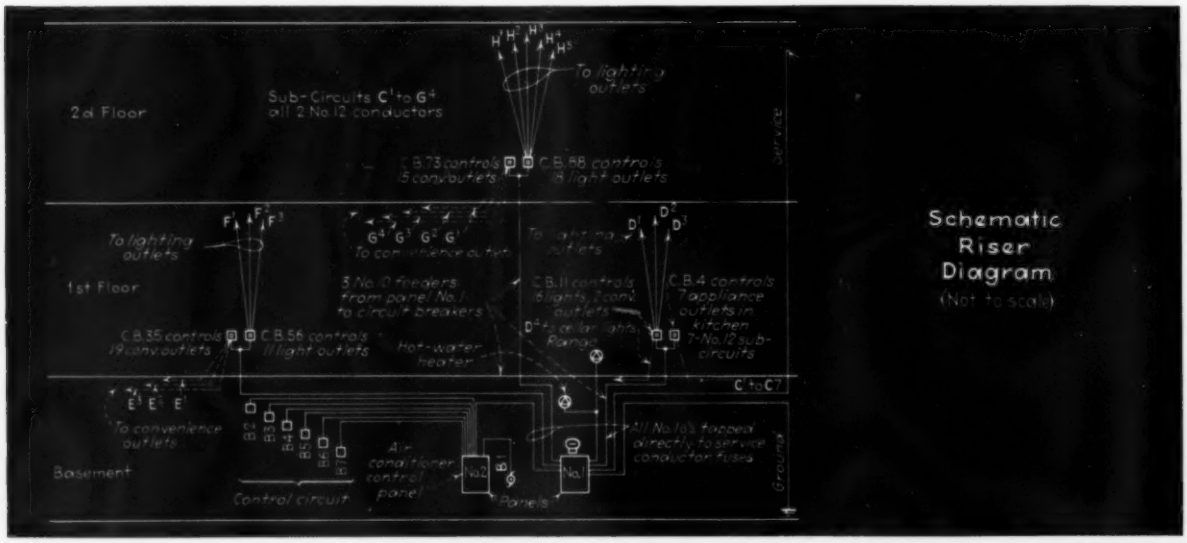
Likewise, another circuit of No. 10 could later be installed in the basement to an additional breaker in the kitchen and connected to any of the seven No. 12 sub-circuits that it might be desirable to take away from the present No. 10 circuit and its 20-amp. breaker.

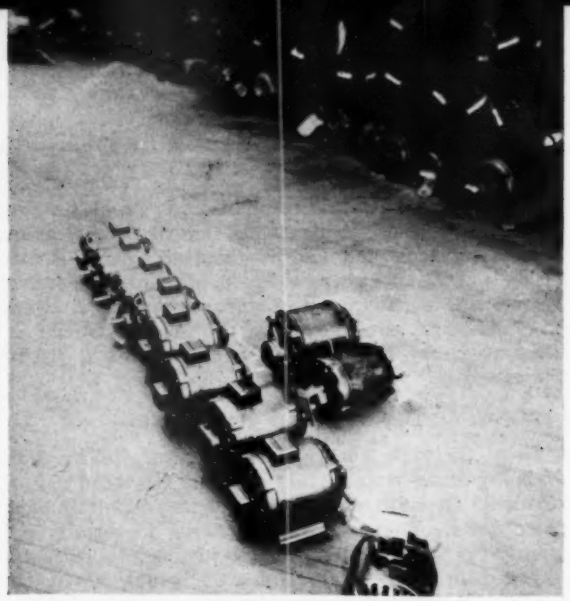
From a mechanical standpoint, the radial sub-circuit system, involving No. 12 wire runs which dead-end at single outlets, simplifies the wire forming, connecting and splicing problem within the various appliance outlet boxes. This should also permit the easy installation of future outlets.

The concentration of wires at the appliance circuit breaker offsets some of the foregoing installation advantages. Seven No. 12 runs, or fourteen sub-circuit conductors, plus two No. 10's, must be connected to the breaker within an outlet box.

Section 512-q of the 1933 Code requires 36.5 cu.in. of free outlet box space to accommodate these wires, therefore, the choice of a roomy outlet box will be helpful from a labor cost standpoint.

A modified application of the radial sub-circuit system is to be found throughout the "New American" homes. In no other cases, however, are individual outlets on separate runs. Instead, several outlets located in certain areas are connected to one No. 12 sub-circuit.





The completed job represents a 24-hour service, which includes changing the terminals to the top of frame, conversion from oil-ring to wick type lubrication, complete cleaning, and acid-bath brightening of interior parts, regardless of the general repairs that are otherwise made. The completed job must have the appearance and performance of a new motor.

24-Hour Fractional Motor Service

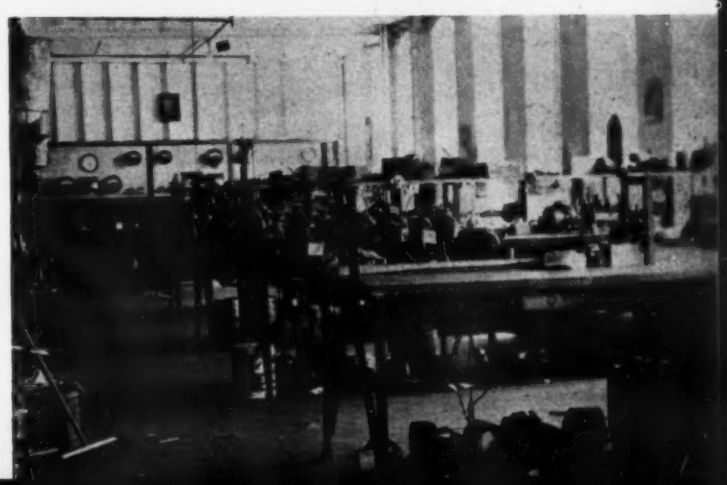
FROM Maine to Florida and from the Atlantic seaboard to Kansas City, come small motor repair jobs by freight, by truck and by express to the Electric Refrigerator Motor Company, Inc., of Philadelphia, Pa. A daily production flow averaging sixty motors, at a seasonal peak often running as high as 125 per day is handled without confusion under a production method that has been developed for this special field of activity. Rush orders have been routed through this plant for complete reconditioning in a total elapsed time of two hours between the receiving racks to the completion of the final touch-dry spraying operation. The normal reconditioning schedule is twenty-four hours.

Motors above 3-hp. are rarely handled, the major portion being fractionals. This company's field comprises refrigerator, oil burner and washing machine motors. No work is accepted from private individuals, dealings being limited to ice cream manufacturers, equipment sales organizations and other dealers. This policy was adopted since commencing business in 1929. It was found inadvisable to deal direct with the public on individual motor troubles, since many of these cases would require home service calls. This organization was built up instead to function as a specialized shop unit, to deal primarily with firms which were more or

Stator coil winding heads are adjustable and instantly collapsible. When a series of telescoping coils has been wound the entire group of three, four or more coils is quickly tied and laid aside. No knocking-down of bolted forms is necessary.

Machine work is an important part of this company's small motor business. Small internal parts, new motor terminal housings and thermal protector units are made here, while small bench lathes at the left of this area are used for armature work.

Four assembling and connecting benches in this department each provide ample working space for four men. This arrangement permits greater efficiency of the floor area than the continuous wall-bench method. Final performance tests are made at the large testing board in the background, where torque, wattage, current consumption, brush and spring tension and end play are checked.



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Reconditioned motors are racked in wall shelves for the final spray finish. A 2-minute drying lacquer is applied in the booth.

Growler test rack and adjustable commutator segment testing contact. Flat face and cylindrical commutators are easily tested out by changing the position of the spring bronze contact finger bracket. A milli-volt meter is cross-connected with a shunt coil for testing armature coil short circuits. Sensitive armature ground tests are made at this rack by the neon tube glow method. This outfit is claimed to save many complete armature rewinds due to accurate individual coil tests.

Armatures are placed on revolving-head tripods, thus permitting the operator to be comfortably seated while at work. Hand needles or guides are used which maintain pairs of magnet wire in parallel position during the winding operation. No crosses can occur to pinch or chafe the insulation between these conductors.

less familiar with motor reconditioning problems. For that reason such smaller work as vacuum cleaners, fans, appliances, and likewise control apparatus, and larger power motors are not accepted. The same is true of automotive generator and starter motor repair work. The additional equipment and routine that would become necessary for handling such work would disrupt the company's production flow.

Departmental Operations

From the experience gained in the special handling of many small motors, this company has been able to divide its reconditioning operations into definitely coded work units. The plant was arranged to permit from twenty-five to thirty-five employees being kept efficiently engaged in mass production, each group having its routine limited in scope thus tending toward specialized mechanical skill.

Incoming motor jobs are written up on simplified work-order tags. Parts of these tags which follow the motor through the shop to completion are simplified to reduce the need for entries or shop instructions. Since practically all motors are regular production orders from firms which know the established unit charges that will apply, no individual motor inspections are made. They are placed in work without delay and billed upon completion in accordance with the reconditioning operations found necessary.

Production flow involves the following steps:

(1) Receiving and tagging.

(2) Placing on a series of wall shelves for pick-up by workmen in consecutive order.

(3) Armature and stator tests.

(4) Armature winding.

(5) Stator burn-off and stripping.

(6) Stator coil winding.

(6-A) Baking.

(7) Machine shop, new motor terminal leads, commutator turning, and special parts.

(8) Cleaning and brushing of all parts, acid bath.

(9) Bench assembly, connection.

(10) Performance test bench.

(11) Spraying.

(12) Stamping for future identification, ready for pick-up at shipping dock.

Some Reconditioning Practices

The terminals of all ice cream cabinet motors are changed to the top side of the motor frame, during reconditioning. This is claimed to save considerable time in removing these motors from their crowded locations. A special hinged-cover terminal housing was developed by this company for this purpose.

Oil-ring type bearings are converted to wick-type lubrication as a standard operation. A thermal motor protector which this company perfected, and which fits in their motor terminal housing, is installed when specified. A five-year motor winding guarantee is given with all such protected motors. Some internal mechanical parts, such as centrifugal switches are made in this company's own machine shop for use with its reconditioning jobs. Interior metal parts, such as brush arms are washed in solvent, brushed with wire wheel and immersed in a final acid solution, thus after the final sprayed lacquer finish, the motors look like new.

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20,000th Red Seal Home

TORONTO, Canada, the birthplace of Red Seal wiring, is now building its twenty thousandth home wired to the Red Seal standards of adequacy.

In the twelve years that the Electric Service League of Toronto has been engaged in the promotion of Red Seal wiring, nearly a million outlets have been provided in the 20,000 certified homes, all of which are completely wired for electric ranges, with service providing for electric water heating, electric grates, etc.

In the last five years approximately 90 per cent of all the new homes built in Toronto have been Red Seal wired, and to an average of sixty-six outlets per house. When the plan started, the average was thirty to thirty-five per house. This year the league is still further increasing the number of outlets required for certification.

Some 300 builders, which represents almost every house builder of account, is pledged to build only Red Seal wired houses, with the result that the Toronto plan extends over all types of residences, from the very smallest to the larger homes.

The twenty thousandth home is an average house, built by a speculative builder to sell at around $12,500. The wiring is detailed in the accompanying table.

WIRING DETAILS FOR TORONTO'S 20,000TH RED SEAL HOME

FRONT PORCH:
2 lights, 1 switch

VESTIBULE:
1 light, 1 switch

CLOAK ROOM:
1 light, 1 automatic switch

LOWER HALL:
1 light, 2-3 way, 1 plug

LIVING ROOM:
1 light, 1 switch, 4 brackets on 1 switch, 4 base plugs, 1 mantel cap plug, 1 radio plug

DINING ROOM:
3 lights, 1 switch. 2 plugs, floor call to kitchen

KITCHEN:
2 lights, 1 switch, 3 plugs, ventilating fan, flush call from dining room and master bedroom, call button to maid's room, back door bell

BREAKFAST ROOM:
2 lights, 1 switch, 1 plug

BACK PORCH:
1 light, 1 switch

GARAGE:
1 light, 2-3 ways, 1 plug

UPPER HALL:
1 light, 2-3 ways

BACK UPPER HALL:
1 light, 1 switch

MASTER BEDROOM:
1 light, 1 switch, 2 C/C lights, 2 auto. switches, 2 bracket lights, 5 plugs, 1 telephone extension plug, call button to maid's room and kitchen

NO. 2 BED ROOM:
1 light, 1 switch, 2 bracket lights, 2 plugs

NO. 3 BED ROOM:
1 light, 1 switch, 2 plugs

NO. 4 BEDROOM:
1 light, 1 switch, 1 plug

DEN:
4 bracket lights, 1 switch, 3 plugs, 1 radio plug. 3-wire grate outlet

MAIN BATH:
2 bracket lights, 1 switch

MASTER BATH:
2 bracket lights, 1 switch

MAID'S BATH:
1 light, 1 switch

WASHROOM:
1 light, 1 switch

CELLAR WAY:
2 lights, 1 switch

RECREATION:
4 lights, 1 switch, 2 plugs

LAUNDRY:
1 light, 1 switch, 1 plug

BOILER ROOM:
1 light, 1 switch,
1 blower outlet

FRUIT CELLAR:
1 light

1/13th His Former Competition

By creative selling of industrial lighting, Ralph K. Robinson has taken his business out of the opportunity-to-bid type of competition.

IN seeking a means of "beating the depression" Ralph K. Robinson of Charlotte, N. C., was impressed by the fact that while approximately 7 per cent of the electrical contractors were engaged in creative selling, the remaining 93 per cent being apparently content with a chance to bid, it was the smaller group that was keeping busy and getting the profitable work.

The problem, of course, was first what to sell, for while the Robinson Electric Company wanted more wiring installation, it was obvious to Mr. Robinson that this could come only as the result of creating a definite kind of load demand.

The opportunity was offered when the Better Light-Better Sight campaign was introduced two years ago. Mr. Robinson decided to take advantage of the demand thus created, and to specialize in industrial lighting.

Early in this work it was found that the major problem involved was in keeping the prospect's attention away from the cost of lighting equipment and wiring, until he had been thoroughly sold on the need for better lighting. To meet this problem, Mr. Robinson developed a sales technique which has proved particularly effective in landing industrial lighting jobs.

This sales technique, in a few words, is simply studying the actual problems of the prospect, and translating these in terms of light. Thus in the case of a textile mill, for instance, he sold a guaranteed solution for expensive losses in its production. The lighting equipment, the complete feeder and circuit re-wiring, and the increased cost of current became incidental to the profit that this investment assured the mill owners.

The elimination of frequent errors that were appearing in a daily newspaper was worth a creative selling job. The reduction of this problem to terms of results as compared with the total investment sold another installation. Again the sightmeter and the working plane held the limelight when it would have been impossible to sell lighting reflectors or wiring.

An investigation among a large clerical force was initiated by Mr. Robinson. The number of young people who had recently bought glasses, who were receiving eye treatment, or who admitted intermittent headaches, sold a 25-foot candle installation which involved a $7,000 equipment investment.

From now on you will find Mr. Robinson focusing the customer's interest upon guaranteed results, the working plane, and sight saving. Let the ninety-three per cent try to sell equipment, conduit, panelboards and labor. After once doing a guaranteed lighting job, the selling objectives come down off the ceiling.

By thus focusing the customer's attention upon guaranteed results to be secured from improved lighting, Mr. Robinson finds that the hurdle of installation and equipment cost does not have to be taken until after the customer has been sold, when it is comparatively easy to discuss the matter of cost.

Moreover, he has found that creative selling, by taking his business out of the 93 per cent opportunity-to-bid seeking group, and putting it in the 7 per cent marketing group, has reduced his competition to one-thirteenth what it formerly was. And also, this new competition is not so much one of fighting for the same job as it is being the first to locate a prospect and sell him. Where the old competition was like having one's back to the wall, and giving in because of grim necessity, the new competition has all of the pleasure of a game. When you win you do not have to check back to see what it cost you.

Three views of the show held in one of the school buildings.

The demonstrations are shown in the middle panel. The equipment displays were on the two sides

The First Electrical Safety Show

ELECTRICAL SHOW ATTRACTED 1,500 DURING THREE DAYS
SAFETY SHOW IS READY TO OPEN TUESDAY
40 PRIZES TO BE AWARDED AT SAFETY SHOW
ELECTRICAL SHOW TO TEACH SAFETY PLANNED APRIL 9
PRESS-GAZETTE
SAFETY SHOW PLANS MADE

Some of the local publicity.

WHILE there have been many lectures and demonstrations of electrical hazards, the first electrical safety show of record was that held in Green Bay, Wis., on April 9, 10 and 11. Four presentations of the show were given in this city of 40,000 population in the three days, to a total attendance of 1,500 people.

The program, designed to show the life and fire hazards resulting from defective or improper electrical installations or the careless handling of electricity, was made up of lectures and demonstrations. These demonstrations used appliances and equipment in common use in the average home. In addition there were displays by manufacturers, agents and wholesalers, showing approved material.

Under the sponsorship of the Electrical League, the fire department, the electrical inspection department, the contractors association, the electrical workers' union, the vocational school, and the Wisconsin Public Service Corporation, the show was divided into four acts, (1) fire hazards, (2) life hazards, (3) effect of defective wiring on radio reception, and (4) the part good lighting plays in safety.

Ralph Drum, chief of the fire department, took the first topic, and after telling about the number of fires

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occurring in Green Bay as the result of defective wiring, over-fusing of circuits, or use of dangerous equipment, demonstrated with a special board the effect of over-fusing when over-loading occurs.

The demonstration first showed a short circuit under proper fusing, resulting in cutting off of the current and elimination of further danger. Then a penny was placed in back of the "blown" fuse and the circuit again overloaded. First he showed how wire is burned between walls of a building, when over-loading and over-fusing occurs, and then, as a climax to the demonstration, the cord leading to a floor lamp was burnt up, in exactly the manner it might burn in a home, if the same conditions as to the fusing and "shorts" existed.

The second act of the show was taken over by City Electrician H. J. Bero, who demonstrated the shock hazards that actually occur with faulty appliances and improperly hung fixtures.

A demonstration of the interference to radio reception caused by faulty wiring and devices, was then given by Frank Staskas of the Wisconsin Public Service Corporation, in order to impress upon the public that the radio in fact announced defective electrical equipment before it becomes a menace to life or property.

The final act was a talk by W. T. Harrison, Westinghouse Lamp Company, on the development of the incandescent lamp, the part good lighting plays in the reduction of accidents and the preservation of eyesight, with a demonstration of the so-called "black light."

The entire show was conducted with John Sargent of the power company as master of ceremonies, G. T. Fiedler, electrical instructor in the vocational school, who prepared the demonstrations, assisted in carrying them out. Al De Groot, electrical contractor and head of the league, was general chairman.

The local press gave the show a large amount of favorable publicity, carrying nice heads as shown. In all the cooperation of industry, educational and municipal interests made it possible for the show to get this attention and to interest the public.

As a further part of the safety in the home movement in Green Bay, the Electrical League has had 10,000 bulletins on electrical safety printed and sent to all users of electricity in the district. Other bulletins of a similar nature will be sent out from time to time.

Why Portland Extends Code Provisions

By L. W. Going
Chief Electrical Inspector, Portland, Ore.

IT MAY be conservatively stated that nine out of every ten wiring jobs are installed without other specification than the minimum requirements established by city ordinance. The public, as well as architects, builders and contractors, have shouldered the responsibility for safe and dependable electrical installations upon the city government, and, whether we like it or not, municipal inspection departments have been forced to meet the problem by setting up additional minimum requirements which no contractor or speculative builder dare go below.

The 1935 Portland Electrical Code is of particular interest, therefore, because it indicates quite clearly wherein the provisions of the National Electrical Code must be extended, or restricted, in order that they may be effectively applied in metropolitan areas.

The greatest percentage modification comes in Article 41, on emergency lighting. This is because a city ordinance must definitely prescribe the occupancies where emergency exit and fire escape lights are to be installed and the class of emergency current supply required for each such occupancy. It might be stated, incidentally, that the provisions of Article 41, N. E. C., are rather too liberal to be applied in the larger theatres and are to strict to be applied in the smaller assembly halls, hotels, office buildings, etc.

A somewhat extensive modification of Article 4 (Services) was made necessary because of the local utility companies' desire to establish uniformity in the installation of metering and service equipment. A number of the requirements in the supplement to Article 4 are actually utility requirements, which were made a part of this ordinance in order to assure uniform compliance.

With reference to the treatment of Article 5 (Wiring Methods) the Portland Code endorses those types of wiring which through long years of experience have been found to be the most permanent, most serviceable and safest. Our experience in Portland has proven that economy in wiring costs can be attained best through simplification and standardization of wiring methods. The truth of this statement is borne out by the fact that unit wiring costs for light outlets and ranges on the average are lower in Portland than in most other cities of comparable size.

Requirements for adequate wiring can always be justified up to a certain point from the standpoint of safety. Unfortunately for the electrical industry and the public, this necessary factor to safety in wiring installations has not received sufficient attention in the N. E. C. A study of the Code will show that it contains practically no provisions for branch circuit layout. For this reason, considerable supplementary matter was found necessary in modifying Article 20. The supplementary provisions are minimum safe wiring requirements and are not to be confused with so-called adequacy standards. By minimum safe wiring requirements are meant requirements which will forestall, as far as is reasonably possible, the overloading of circuits and feeders and the use of improper circuit extensions to provide additional outlets.

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Factors to be Considered in the

Selection of Safety Switches for Motor Circuits*

By W. J. Mahan

Past President, International Association of Electrical Inspectors

DURING the rapid development and acceptance of enclosed switches, economic considerations have done much to sway selection of the type and kind for any specific use. As a result, some enclosed switches are often used for circuit rupturing service for which they are not designed or adapted, and under those conditions they may soon fail to perform satisfactorily. It is vitally important, as a safety ensuring consideration, that there be full realization of just what kind of an enclosed switch is designed and adapted for each purpose.

The National Electrical Code recognizes three types of switches, (a) general use, (b) isolating and (c) motor circuit switches.

The general use switch, which in reality is a limited use switch, is intended for use in ordinary distribution and branch circuits. It is rated in amperes and is capable of interrupting its rated current at its rated voltage. Such switches are tested only at high power factor and are not suitable, nor, in many cases, are they capable of opening low power factor loads. Where such switches are used for low power factor loads, such as motor control and control of low power factor gas tube lighting, the National Electric Code limits their use to small motors, not exceeding 2 hp., and further requires a general use switch, when so used, to have an ampere rating at least twice the rating of the device so controlled.

The isolating switch is intended for isolating a circuit from its source of power. It is to be operated only when the circuit has been opened by some other means. Such switches are designed only to carry rated load, but are not designed to be opened under load. Underwriters' Laboratories approves general use switches up to 3,600 amp., but switches rated greater than 1,200 amp., at 250 volts a.c. or d.c., and greater than 600 amp. at more than 250 volts d.c. or a.c. are not tested for breaking load, and must carry a marking on the outside of the enclosing case, reading "For Disconnecting Use," or an equivalent marking.

The motor circuit switch is rated in horsepower and is capable of interrupting the maximum operating overload current of a motor of the same horsepower rating at its rated voltage. The maximum operating overload current of an a.c. motor is considered six times the rated current, and of a d.c. motor, four times the rated current. Some motors have locked rotor currents of ten times rated running current.

Care should be used in the selection of motor circuit switches to be sure that they are designed for the particular motor to be served. For example a 5 hp. motor circuit switch designed for a 3-phase motor is not suitable for a 5 hp. single-phase motor and a switch designed for 5 hp. at 220 volts is not suitable for 5 hp. at 110 volts. In checking motor current values in the Code book it will be found that a 2-phase motor takes only 65 per cent as much current per phase as a single-phase motor of the same horsepower. Using the 5 hp. motor as an example: For a 3-phase motor the current is 15 amp. and for a single-phase motor of the same horsepower and voltage the current is 23 amp. It is readily seen that under such conditions when such a switch designed for a 3-phase is applied to a single-phase motor, it is being used at over 150 per cent of its intended current rating. The locked rotor current, based on six times rated current of the motor, in one case would be 90 amp. and in the other case would be 138 amp.

Aside from the electrical rupturing features and characteristics embodied in the general use and motor circuit switches, there are also many other safety features incorporated into a high quality, well designed switch which the Code does not at present state clearly.

Such safety features include the so-called cover-interlock enclosed switches in industrial and power work, which ensure manipulation of fuses only when such fuses are disconnected from the line and also, to an extent, varying in switches of different manufacture, prevent contact with live parts within the casing are more or less exposed when the cover is open with the switch in the "off" position.

Complete Contacting

It is vitally essential in switches which are operated frequently and are handling substantially large current values at low power factor, particularly on motor circuits, that proper and complete contacting on the circuit closing operation be assured. With switching members operated entirely by the handle, the operator may repeatedly make and break the circuit by just touching the contacting parts, jogging or inching the contacts in and out, so as to cause severe arcing at the insufficiently rugged contacts, resulting in poor future contacting and abnormal heating. When such switches are used for heavy duty industrial or power service they are soon rendered inoperative or destroyed.

Switches in which the handle entirely controls the movement of the switching parts are obviously less expensive to produce and therefore may be lower in first cost than those employing a quick make and quick break mechanism, whereby not only contact opening but also contact closing, when once started, is made assuredly

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complete regardless of full handle movement. Furthermore, such low cost switches do not have built into the conducting and contacting parts the same ability to rupture low power factor loads as is provided in high grade quick make and quick break switches. Field experience has demonstrated that to safely close as well as interrupt industrial and power loads of relatively low power factor, with frequent abnormal current values, switch arms must be mechanically connected to assure full and complete contact closing and also contact opening of the switching parts. These parts as well as all other electrical elements must be of ample proportion, rugged, and of such design as to provide reliable and safe low power factor rupturing.

I received a letter a short time ago asking for guidance where a salesman had endeavored to substitute a so-called general use switch in a place where a motor circuit switch was necessary for safety. This installation consisted of a 15-hp., 220-volt, 3-phase motor, rated at 39 amp. per terminal. The switch recommended by the salesman was a 60-amp. 3-pole fused general use switch. The letter did not state whether this motor was thrown directly across the line or was started through a compensator. Further it did not state whether or not it was a wound rotor motor.

If you will turn to page 118 of your National Electrical Code, you will see the wide range of switches and fuses that may be used with a 15 hp. 3-phase, 220-volt motor, and how carefully the switch must be selected in order to safely perform under such conditions. Following across under 38 or 40 amp. you will note "for across the line starting" the Code recommends a 125-amp. fuse, for "reduced voltage starting" an 80-amp. fuse, and for "wound rotor starting" a 60-amp. fuse. From a fusing standpoint the only type 3-phase, 220-volt motor that this fused switch was capable of taking care of the starting current was the wound rotor motor, but this switch would not safely interrupt the stalled rotor current of this motor. When we look up the definition of a motor circuit switch, we find for a.c. that six times motor load rupturing capacity is necessary. This therefore requires a switch capable of interrupting 234 amp. It is very doubtful if a switch designed to carry and interrupt a high power factor current of only 60-amp. could safely interrupt a low power factor load where six times motor rated current may flow.

The only way to be assured of safely operating switches is to select a switch of high quality, correctly designed and constructed and approved by Underwriters' Laboratories for the specific duty and load to which the switch is to be applied and be sure that the rating corresponds to the horsepower of the motor, the voltage of the circuit and the type of current being used.

During the past several years the electrical inspectors through the sectional activities of their publicity and educational committees have been doing excellent work in bringing to the public attention the safe use of electricity through the use of only Underwriters' Laboratories' approved materials. The electrical inspector should be the prime mover in educating the purchaser and installer to appreciate the safety and economic benefits to be obtained from proper selection of electrical materials for the purpose for which they are intended to serve.

Richmond Has 10% Rejects After Two Years' Sales Control

TWO years ago April, Richmond, Va., enacted a sales control ordinance, and since that time has employed on full time an inspector on continuous store-to-store check up. It was thought that an analysis of the situation in Richmond after two years of steady endeavor to eliminate sub-standard electrical merchandise would be of interest.

During the first three months of 1935, 23,663 items were inspected, of which 2,903 or 14 per cent were rejected as unsafe.

Of the 2,903 sub-standard items 1,967, or 67 per cent were portable lamps. The total number of portable lamps inspected was 4,768, so that more than 40 per cent of such lamps were rejected.

The inspection procedure is carried on without direct cost to the merchant or dealer, therefore, the tendency to save inspection fees by concealing the identity of stock replenishments is reduced. Each merchant is supplied with a letter size notification form upon which to apply to the inspection department for an inspection to cover the items which the merchant has itemized in the body of the application blank.

After an inspection has been made, the merchant is given a green "permit for display and sale," which has listed thereon the items that are found to be safe. A gray carbon copy is retained in the inspection department files. Those items that are sub-standard are listed upon a salmon-colored "do not display or sell" form, which is likewise given to the merchant. A red carbon copy of this form is placed in the files.

The disposition or alteration of all unsafe items is followed closely by the inspector so as to prevent any possibility of misunderstanding. Simple alterations such as bushings, cords, etc., are permitted, but reinspections are made of such altered items before the merchant is permitted to display them.

A SUMMARY OF SALES CONTROL INSPECTIONS

	Jan.	Feb.	March	Total
No. Classes of Items Inspected	77	51	45	173
No. Items Approved	7,849	7,066	5,845	20,760
No. Items Rejected	248	800	1,855	2,903
Total Items Seen	8,097	7,866	7,700	23,663

OUTSTANDING REJECTIONS DURING THE FIRST QUARTER OF 1935

	Jan.	Feb.	March	Total
Clocks	..	27	....	27
Curling Irons	30	...	....	30
Cigar Lighters	..	...	127	127
Cord Sets	..	68	....	68
Portable Lamps	54	428	1,485	1,967
Heating Pads	..	24	....	24
Lamp Adapters	..	...	100	100
Radio Apparatus	41	...	....	41
Soldering Irons	..	36	....	36
Table Stoves	12	...	....	12
Switches, Flush	..	40	....	40
Table Taps	50	...	....	50
Toasters	42	...	....	42
Washers	..	...	23	23

9 Reasons Why the 30-Hour Week Will Not Work

An interview with large and small, union and non-union, electrical contractors of Portland, Ore.

By Henry W. Young
Staff Correspondent

WHILE the 30-hour week, N. R. A., Portland, Ore., area agreement went into effect March 4, 1935, the experience of the electrical contracting industry with the short week in that city extends back for a year. The 30-hour week, by agreement between the electrical workers' union and the union shop contractors, went into effect June 4, 1934, and is still in effect. At the time the agreement was made, the scale was raised from $1.00 per hour to $1.25 per hour. Therefore, the men are now getting $7.50 for six hours' work, as against $8.00 for eight hours.

While about half of the sixty contractors of the area operate open shops, approximately 90 per cent of the work is done under the 30-hour week rule. After a year of experience with the 6-hour day, 5-day week, what do the contractors of Portland have to say about it?

The small contractor who does all his wiring himself, or employs a little outside help sporadically, and carries a union card, is inclined to favor the 30-hour week. He cites no particular advantages to his business. He even states that there is some increase in his overhead which he must pass on to the public. Since all the other building trades in Portland are on the 8-hour basis, he says that he sometimes has to hire extra help to keep up with the other trades on the job. Nevertheless he seems to think that this is overbalanced by the good accomplished in keeping more men at work.

Employing contractors, however, feel that the short day is not only working a hardship on the contractor, but is economically unsound. This feeling is more pronounced the larger the contractor's operations. One of the larger ones thus expressed himself:

"As a contractor, I cannot stand idly by and see my overhead increased on a depressed volume of business. I am hesitant to pass on to the public more and more of this mounting overhead to the point that will ultimately break me if I keep on. This 30-hour week gnaws at the vitals of every contractor who does not work with the tools. It directly favors the so-called contractor who is also his own wireman. This man works six hours a day as a wireman at wages. Then he comes in, changes his clothes and becomes an executive. He keeps books, if he has any, figures jobs, collects, solicits and does the other things that are necessary to 'run' his business. He employs no office help, nor does any of the other things generally assumed to be necessary to a real business. The 30-hour week tends to keep such a man going."

Whether or not the contractors of Portland understood a year ago what the 30-hour week meant, their experience now teaches them that it is bad for the business, and most of the principal ones are of the opinion that as soon as work increases to any considerable extent it will have to be abandoned. They are sick of it. The nine principal reasons are given on this page.

1. They are the only ones of the building trades having the short week. They cannot keep abreast of the other trades on the job. This makes it necessary to hire more men.

2. There is lost time in putting a new man to work, especially on building maintenance work. He must be taken around and shown the building and the requirements. This often must be done by the executive, or a foreman or superintendent. The short-day-more-men principle thus increases costs.

3. Six-hour shifts do not work out well. It is too short a time to permit of having a salaried superintendent or other executive superintend one shift only. He must handle two shifts and this is too hard on him; he eventually cracks or becomes inefficient.

4. On small jobs, with a 6-hour day, if a man finishes one job in early afternoon, the day is "shot" for him. There is not time to go some distance and start another. The man is sent home and the job waits for the next day.

5. The general overhead is not reduced one bit, while in many tangible and intangible ways it is increased by the short day.

6. The 6-hour day, 5-day week increases the necessary man-power 33⅓ per cent. The present state of business does not afford enough jobs. By man-power is not meant man-hours but actual men. Since you cannot have a man and a half on a job, complications arise from the economic standpoint.

7. No greater efficiency of the men themselves has been noted in the 6-hour day. The "let-down" supposedly encountered at the end of an 8-hour day is no more than is found at the end of a 6-hour day.

8. Non-productive time, often called fixed time, in getting started and stopping at the beginning of the day, at noon-time and close, is increased in proportion by the shorter day.

9. The shortened day has made little difference in the day's pay, therefore, labor costs have been increased which must be passed on to the already complaining public.

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Fixture Installation Costs

By Ray Ashley

THE accompanying tables were compiled from information accumulated by firms which had not made a specialty of fixture installations, but which installed fixtures as part of a complete lighting installation. To make such tables workable, they are supplemented with certain percentages which are to be added to, or deducted from the basic units, so that they may be adapted to varying conditions.

The variable percentages are not substantiated by a great deal of accurate information, as estimators find it very difficult to establish the results of varying conditions. Based on experience and available data, however, this table will serve as a good guide.

On a small job, the contractor usually has the fixtures delivered directly to the building and his regular construction men wire and hang them. A large job, however, justifies one's spending a great deal of time shifting men, arranging benches and scaffolding, and equipping temporary workshops, so work can be carried on to the best advantage. The ordinary electrician is not accustomed to much of this work but on a large project, after a few days, he begins to speed up.

A contractor who is installing the wiring has the advantage of being able to use his temporary shop at the building and whatever equipment he may have on the job. He may also be able to install fixtures as the other work progresses. This is a special advantage in industrial plants where the ceilings are high enough to require special scaffolding. If the entire cost of the scaffolding had to be charged against the fixtures, the units would be materially increased. In finished buildings, such as ball rooms, clubs, and banks, one is often able to use the painting contractor's scaffolding.

Ceiling Heights

Irregular ceiling heights may result in a very costly installation. On revision, there may be no plans of the building available, and it becomes necessary to get a ladder and take many special measurements. In power houses, basements, kitchens and other places where ducts, drop beams and pipes have to be cleared, many individual lengths will be required. Such spaces not only require individual measurements for lengths of fixture stems, but often use up considerable time for laying out, in order to properly light machines, and at the same time clear the equipment on the ceiling.

The greatest difficulty is encountered where rigid stem fixtures are used. If the wire, on a chain fixture, is left long enough, it is not a difficult matter to change the length by removing or adding a link of chain.

Costs may vary a great deal on buildings coming under the same classification, such as office buildings, factories or warehouses. An office building may be a few stories high with large open floor spaces, or it may be a tall building, with a low square foot area per floor, and small rooms. In the latter case costs will be much higher than in the former, due to the extra labor required for distributing fixtures, moving tools, and the lost time waiting for elevators.

The contractor doing the wiring job may have a contract to install just the fixtures for machinery and utility rooms. His work then becomes scattered, with only a few fixtures in each location. The cost per unit of such an installation cannot be used for figuring work where a hundred or more fixtures may be grouped in one large office or factory.

Percentages to Compensate for Varying Conditions

VARIABLE	TYPE OF INSTALLATION					
	MULTIPLE SOCKET		COMMERCIAL		INDUSTRIAL	
	Wire and Assemble	Hang	Wire and Assemble	Hang	Wire and Assemble	Hang
Size of project	5-10	5-10	5-15	5-20	5-15	5-20
Experience of workmen	5-20	5-10	5-10	5-10	2-5	2-5
Facilities for doing work	2-15	2-10	2-15	2-10	2-10	2-15
Irregularities in ceiling height	1-5	1-5	1-4	0-4	0-15	2-5
Type of building	0-4	5-10	0-5	5-8	0-15	5-25
Alterations and revisions	0-4	0-40	0-4	0-40	0-5	0-40
Methods of doing work	5-25	5-20	3-10	3-10	5-10	5-10

The above units may be either for additions to or deductions from the basic units, depending on whether the variations from normal conditions are in favor of or against the job. On most jobs, some of the units will be for additions, some for deductions, and others will not be used.

Multiple Socket Fixtures

(For Quantities of 10 to 50)
Labor in Man Hours

Type & Size	Wire & Assemble	Hanging Ceiling Height 10 ft.	12 ft.	16 ft.	Wire, Assemble & Hang Ceiling Height 10 ft.	12 ft.	16 ft.
Ceiling							
2-Light	0.5	0.25	0.32	0.45	0.75	0.82	0.95
3-Light	0.7	0.28	0.37	0.52	0.98	1.07	1.22
4-Light	0.85	0.32	0.42	0.58	1.17	1.27	1.43
5-Light	1.0	0.33	0.45	0.62	1.33	1.45	1.62
6-Light	1.1	0.37	0.47	0.67	1.47	1.57	1.77
Chain Pendant							
2-Light	0.55	0.30	0.37	0.50	0.85	0.92	1.05
3-Light	0.80	0.35	0.43	0.58	1.15	1.23	1.38
4-Light	1.05	0.4	0.50	0.67	1.45	1.55	1.72
5-Light	1.32	0.43	0.53	0.7	1.75	1.85	2.02
6-Light	1.6	0.47	0.55	0.75	2.07	2.15	2.35
Bracket							
2-Light	0.34	0.26	0.27	0.33	0.60	0.61	0.67
3-Light	0.56	0.28	0.27	0.33	0.84	0.83	0.89
4-Light	0.80	0.30	0.30	0.40	1.10	1.10	1.20

The best one can do in establishing units for alterations, is to consider the two extreme conditions which may occur, and then see where the job at hand belongs between the two.

The one extreme is where spaces are occupied, and crowded with desks and office equipment or machinery, and the other is that of a complete revision with all floors cleared. In the occupied office spaces labor may be 10 to 30 per cent above normal. Tools must be put away every night, fixtures must be installed as soon as they are delivered to the floor, furniture has to be moved, and greatest of care must be exercised at all times to avoid interference with the occupants. In manufacturing plants, it is often necessary to work over machines and around moving belts and pulleys. In such plants the cost of hanging fixtures has run as high as 50 per cent above normal. All the work was performed under adverse conditions, and some of it had to be done on overtime, while the plant was shut down.

A complete alteration job may present even better conditions than those encountered in a new building. Elevator service may be better, the work may be less dependent on other trades, and spaces for assembling and storing (temporarily) fixtures may be much better.

Methods of organizing and conducting work depend a great deal on the size and type of the installation. The larger installations require by far the most forethought, and present the greatest opportunity for a good superintendent to display his ability. The entire procedure must be timed so that all groups will be working together. Schedules must be arranged so that materials will move regularly from the manufacturer to the assemblers, and from the assemblers to the hangers. The superintendent must be able to estimate the progress of the other trades, so that he will not get ahead of the job. Plans showing the location of various types of fixtures, together with schedules, giving the number required should be prepared. Variations in ceiling heights should be taken care of by showing the over-all length of fixtures on both the plans and the schedule. Such symbols as "C-30" may be used where "C" stands for the style of fixture, and "30" represents the over-all length in inches of the feature.

The table of variations shows units which may be for either additions or deductions.

No consideration has been given in this table to the 6-hour day, "labor rotation," and "labor shifts." The table covers only a few of the major variables. There are certain factors peculiar to each locality, each job and each type of fixture, which the individual estimator must take into consideration.

Industrial Types

(For Quantities of 10 to 50)
Labor in Man Hours

Type & Size	Wire & Assemble	Hanging Ceiling Height 12 ft.	18 ft.	25 ft.	Wire, Assemble & Hang Ceiling Height 12 ft.	18 ft.	25 ft.
Porcelain Enamel Conduit Stem							
50 watt	0.43	0.33	0.38	0.5	0.76	0.81	0.93
100 watt	0.47	0.35	0.40	0.53	0.82	0.87	1.00
200 watt	0.47	0.37	0.42	0.55	0.84	0.89	1.02
300 watt	0.50	0.40	0.47	0.60	0.90	0.97	1.10
500 watt	0.55	0.43	0.55	0.65	0.98	1.10	1.20
750 watt	0.58	0.47	0.58	0.70	1.05	1.16	1.28
1000 watt	0.67	0.53	0.63	0.80	1.20	1.30	1.47
Glass Steel Units							
100 watt	0.50	0.42	0.48	0.60	0.92	0.98	1.10
200 watt	0.54	0.47	0.53	0.70	1.01	1.07	1.24
300 watt	0.57	0.50	0.58	0.75	1.07	1.15	1.32
500 watt	0.60	0.57	0.67	0.85	1.17	1.27	1.45
750 watt	0.65	0.62	0.72	0.93	1.27	1.37	1.58
1000 watt	0.75	0.70	0.82	1.05	1.45	1.57	1.80
Vapor Proof Fittings and Globe							
50 watt	0.54	0.37	0.42	0.55	0.91	0.96	1.09
100 watt	0.54	0.37	0.42	0.55	0.91	0.96	1.09
200 watt	0.57	0.40	0.47	0.58	0.97	1.04	1.15
Explosion Proof Fixture with Reflector*							
50 watt	1.00	0.25	0.35	0.50	1.25	1.35	1.50
100 watt	1.00	0.45	0.55	1.15	1.45	1.55	2.15
200 watt	1.25	1.00	1.10	1.25	2.25	2.35	2.50
300 watt	2.00	1.25	1.50	2.30	3.25	3.50	4.30
500 watt	2.00	1.25	1.50	2.30	3.25	3.50	4.30

*Units given for explosion proof fixtures were established from data accumulated on large installations only.

Commercial Types

(For Quantities of 10 to 50)
Labor in Man Hours

Type & Size	Wire & Assemble	Hanging Ceiling Height 10 ft.	15 ft.	20 ft.	Wire, Assemble & Hang Ceiling Height 10 ft.	15 ft.	20 ft.
Ceiling Fixture and Globe							
50 watt	0.28	0.37	0.43	0.58	0.65	0.71	0.86
100 watt	0.28	0.40	0.47	0.63	0.68	0.75	0.91
200 watt	0.30	0.42	0.50	0.67	0.72	0.80	0.97
300 watt	0.33	0.45	0.55	0.73	0.78	0.88	1.06
500 watt	0.33	0.48	0.58	0.75	0.81	0.91	1.08
Pendant Chain and Globe							
50 watt	0.40	0.35	0.47	0.63	0.75	0.87	1.03
100 watt	0.43	0.42	0.50	0.67	0.85	0.93	1.10
200 watt	0.43	0.42	0.50	0.71	0.85	0.93	1.14
300 watt	0.47	0.47	0.55	0.77	0.94	1.02	1.24
500 watt	0.47	0.50	0.63	0.80	0.97	1.10	1.27
750 watt	0.50	0.53	0.67	0.83	1.03	1.17	1.33
1000 watt	0.58	0.58	0.70	0.90	1.16	1.28	1.48
Stem with Globe							
50 watt	0.40	0.43	0.50	0.67	0.83	0.90	1.07
100 watt	0.43	0.45	0.53	0.71	0.88	0.96	1.14
200 watt	0.43	0.45	0.53	0.73	0.88	0.96	1.16
300 watt	0.47	0.50	0.62	0.78	0.97	1.09	1.25
500 watt	0.50	0.53	0.67	0.83	1.03	1.17	1.33
750 watt	0.55	0.57	0.70	0.87	1.12	1.25	1.42
1000 watt	0.63	0.60	0.75	0.92	1.23	1.38	1.55
Indirect, Opaque Bowl (Simple Type)							
50 watt	0.42	0.45	0.50	0.67	0.87	0.92	1.09
100 watt	0.42	0.45	0.53	0.71	0.87	0.95	1.13
200 watt	0.47	0.47	0.55	0.73	0.94	1.02	1.20
300 watt	0.53	0.50	0.57	0.78	1.03	1.10	1.31
500 watt	0.53	0.53	0.67	0.83	1.06	1.20	1.36
750 watt	0.58	0.58	0.70	0.87	1.16	1.28	1.45
1000 watt	0.67	0.63	0.75	0.92	1.30	1.42	1.59
Indirect, Luminous Bowl							
50 watt	0.43	0.50	0.55	0.75	0.93	0.98	1.18
100 watt	0.47	0.53	0.58	0.80	1.00	1.05	1.27
200 watt	0.53	0.55	0.60	0.83	1.08	1.13	1.36
300 watt	0.57	0.58	0.67	0.87	1.15	1.24	1.44
500 watt	0.62	0.60	0.72	0.92	1.22	1.34	1.54
750 watt	0.67	0.63	0.75	0.95	1.30	1.42	1.62
1000 watt	0.75	0.67	0.83	1.00	1.42	1.58	1.75

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Construction . . Methods . . . .

Paint-Guards for New Wiring Devices

Pieces of ordinary card board from device cartons may be bent into U-shaped strips and shoved back into switch boxes around switches and receptacles, thus shielding them from becoming covered with paint or enamel. Wm. Berken of Jamaica, N. Y., installs all wiring devices in his Long Island residence jobs before the painting operations, and reports very little trouble from paint blotches upon the devices. This method was adopted to avoid the possible "smudging" of delicately tinted walls or wall paper, as might occur if wiring devices were installed after the painting had been completed.

Outlet Supports for Fabricated Steel Joists

The use of fabricated steel ceiling joists in the upper floor area of a new Long Island high school at

Hempstead, N. Y., required various ceiling outlets to be supported in various positions between joists, independently of the conduit runs. Deep octagonal concrete boxes were used, provided with punched hanger bar slots in the opposite walls. These slots accommodated pairs of 3/16-in. by ⅜-in. iron box supporting bars that were secured to the adjacent joist members with tie-wires. The depth of these boxes allowed the conduit to be run horizontally without off-sets upon the upper edge of the angle iron which comprised the bottom horizontal joist member. This method was employed by the Meeker Electric Co., Williston Park, N. Y.

Free-Standing Starter Racks

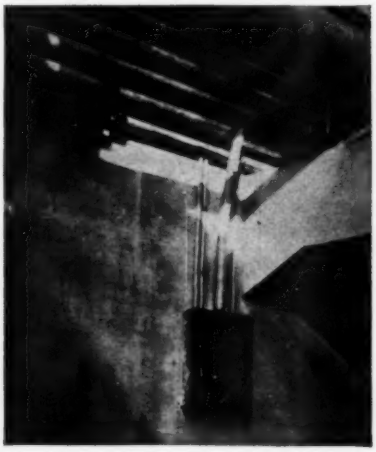
A rigid free-standing rack design which accommodates heavy starters and large line switches is made with short pieces of standard angle iron.

A minimum amount of floor space is taken up, and the control equipment can thus be placed close by the motor, yet not depend upon the motor base foundation or motor frame for bracing support. Thus there is greater clearance around all sides of the motor for cleaning, oiling or replacement. This method often permits lessening the length of feeder runs below that which would be required if wall mountings at out-of-the-way locations were employed.

Several such racks were built for a number of 20 h.p. compressor motors which were wired by L. K. Comstock and Co., Inc., New York, N. Y. The floor plates, vertical members, braces and horizontal members were made out of 3-in. by 3-in. angle iron. The entire assembly for one rack was welded instead of being bolted. Two bolts and expansion shields per floor plate secure the rack to the concrete floor in a rigid manner, while the welds which are provided at all places where two pieces of iron are joined together prevent the rack from sagging or twisting out of shape.

Wall Mounting Rack for Large Conduits

Groups of large conduits may be installed horizontally upon the walls of a structure so as not to interfere with or require expensive offsets of smaller vertical conduit for lights or motors. In wiring for the numerous motors used in connection with sev-



eral large stamping presses in a Cleveland automobile body manufacturing plant, all of the power and lighting conduits in the press pits were installed exposed. At most places it was necessary to provide horizontal runs of 4 in. conduit around the pit walls to banks of safety switches, while there were numerous smaller vertical runs for pit lights, receptacles, switches and smaller motors.

By strapping the large conduits to 1½ in. by 4 in. channel mounting brackets or racks which were in turn secured to the concrete wall with expansion bolts, a sufficient clearance was provided to allow the installation of 1 in. and smaller vertical conduits behind the large horizontal conduits, thus requiring no bends or offsets for

● Consider the electrical installation work you are doing today. When 1945 comes, your job will have been finished ten years. The workmanship was honest. Lasting, reliable products were installed . . . G-E Wire and Cable, G-E Wiring Devices. All those years, the whole Wiring System . . . G-E Building Wire, G-E Switches, G-E Convenience Outlets, etc. . . . performed efficiently, safely. That owner was well satisfied. And that's why in 1945, ten years later, you were called in again to extend a circuit to the new bedroom.

The more you create that situation, the more your business profits. Satisfied users of your services and products will give you the names of their friends and perhaps industrial companies needing a reliable electrical contractor.

But make sure that you do not miss any business. Cover all homes and industrial plants systematically — house by house, company by company. Offer homes and industrials: 1. Free inspection of electrical wiring and equipment. 2. A check-up on lighting equipment with Sight Meter. Industrials can also be offered a regular monthly electrical inspection service for a small fee.

Sell your services and products — G-E Wire and Cable and G-E Wiring Devices — for lasting satisfaction . . . more jobs . . . GREATER PROFITS. Write for full information to Section DW-487, Merchandise Department, General Electric Company, Bridgeport, Connecticut.

GENERAL ELECTRIC

WIRING MATERIALS

MERCHANDISE DEPARTMENT, GENERAL ELECTRIC COMPANY, BRIDGEPORT, CONNECTICUT

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THE WIREMOLD ZONE

THERE IS A WIREMOLD ZONE OF USEFULNESS AND PROFIT IN EVERY FIELD OF WIRING PRACTICE!

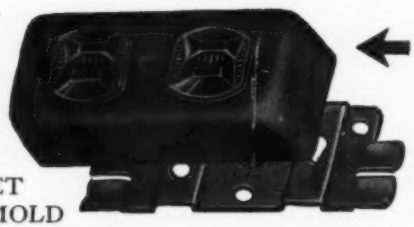
NUMBER 9 OF A SERIES ON WIRING OPPORTUNITIES

For instance—

FAN JOBS

and the famous WIREMOLD

"Forty Threes"



← 243

and

5743

USED WITH 200 MIDGET WIREMOLD

USED WITH 500 OR 700 WIREMOLD

NOW is the time when your customers clamor for more outlets—in a hurry. As usual Wiremold provides the answer—a quick, economical and satisfactory installation.

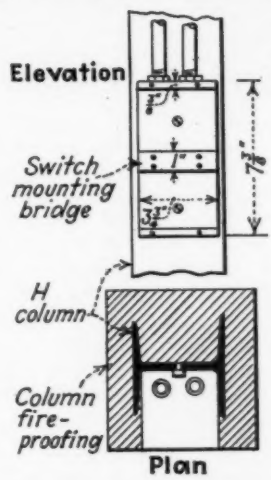
THE WIREMOLD COMPANY, Hartford, Conn.

such cross-overs. The horizontal conduit runs were double-decked in some instances by bolting a second series of vertical channels to the first group of horizontal conduits. Where double decks were employed the pull box depths were increased to accommodate two rows of large conduit knockouts.

In the accompanying illustration of work installed by the Hatfield Electric Company there are four 4-in. conduits and one 2½-in. horizontal conduit, with an additional 2-in. double-decked conduit stubbing down to a lighting cabinet, from which three ¾-in. vertical conduits are installed vertically behind the larger conduits to their respective circuit routes at the upper part of the press pit.

Flush Switch Gangs in Steel Columns

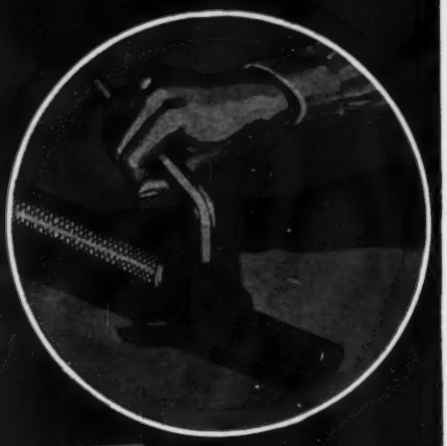
A large number of switches used to control aisle lights in the library stacks of Temple University, Philadelphia, Pa., had to be concealed in the webs of fireproofed H-columns. Most of these switches were in groups of four, and were all required



to be on one side of the column. The Electric Power and Construction Company, designed special 16-ga. boxes which were sufficiently deep to permit bolting the back of the box to tapped holes in the column web, while the front of the box finished flush with the plaster line. These deep boxes provided plenty of back-wiring space and furthermore allowed the rigid installation of box to the column, and the extension of conduits to the floor form line above in advance of the form builders. By making sketches of each type of box to suit the steel dimensions, these boxes, numbering more than 300 in several types, were all made up in ad-

Bull Dog WIRE GRIPS

The All-Copper Cold-Pressed SOLDERLESS CONNECTOR



Highest Conductivity - - Greater Mechanical Strength - - Complete Line with Fewer Items

(1) HIGHEST CONDUCTIVITY—*Because* not being castings, the composing metal can be and is, *pure electrolytic copper.*

(2) GREATER MECHANICAL STRENGTH—*Because* these Connectors are "Cold Flowed" to shape, thus preserving the structure and increasing the tensile strength of the composing metal, so that it can "take" all the clamping pressure necessary for good contact.

(3) BETTER CONTACT ASSURED—*Because* their *clear* wire holes (in contrast to blind holes) permit you to SEE and secure full contact.

(4) MORE COMPLETE SERVICE—*Because* fewer sizes (5 only) constitute the line, thus reducing the inventory while ensuring that a size for every possible requirement will always be on hand.

Manufactured and Sold in Canada by
BULL DOG ELECTRIC PRODUCTS OF CANADA, LTD.
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BULLDOG ELECTRIC PRODUCTS CO.
DETROIT, MICH., U. S. A.

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Read what E. A. Koeneman says about ELECTRUNITE

REG. U. S. PATENT OFFICE

Steeltubes

E. A. KOENEMAN ELECTRIC CO.
CONTRACTORS AND ENGINEERS
REPAIRING REWINDING
SAINT LOUIS

April 25, 1935
S-4

Electrical Division,
Steel and Tubes, Inc.,
224 East 13th Street,
Cleveland, Ohio

Attention - Mr. M.J.Whitfield,
Manager, Conduit Sales.

Gentlemen:

As pioneers in the Electrical Contracting field, and in the installation of ELECTRUNITE Steel Tubes, we believe that we are qualified to pass on the merits of this product.

On the St.Louis Custom House and Court House Building more than 200,000 feet of ELECTRUNITE Steel Tubes has been installed, and we are pleased to advise you that this installation so far is a very decided success in every way, and it is, therefore, our pleasure to recommend this material for all classes of construction.

It is our opinion that your product is a very important contribution to the Electrical Industry, both from an economic and a practical view point, and it is our intention to use it extensively on all future installations.

Very truly yours,

E.A.KOENEMAN ELECTRIC COMPANY

BY E.A. Koeneman

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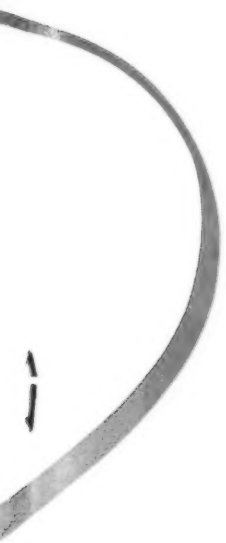
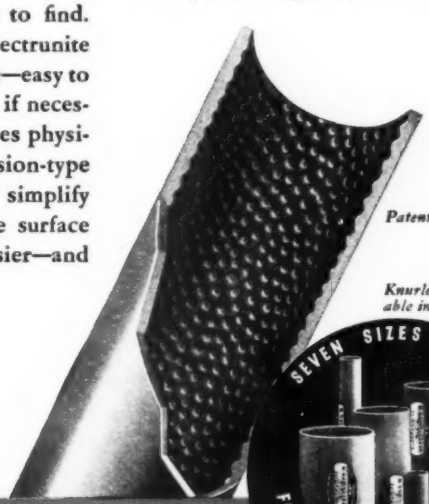
SAVES 5 TO 15%

". . . a very important contribution to the Electrical Industry, both from an economic and a practical viewpoint . . ."—that's what Mr. E. A. Koeneman thinks of Electrunite Steeltubes. And with his wide experience in the electrical contracting field, plus his practical knowledge of the advantages of Electrunite Steeltubes gained in installing more than 200,000 feet in St. Louis' new 4½-million-dollar Federal Building, he should be well qualified to judge electrical conduit.

The electric resistance weld that makes possible this threadless rigid conduit probably was of as little concern to Mr. Koeneman as it is to the strength of the conduit—for it's as strong as the wall and difficult to find. But he couldn't help but notice that Electrunite Steeltubes is light and easy to handle—easy to cut and bend, straighten and re-bend if necessary—that elimination of threads saves physical effort—that the three compression-type fittings make tight, safe joints and simplify installation—that the knurled inside surface makes wiring approximately 30% easier—and that with all the necessary couplings and connectors Electrunite Steeltubes actually costs approximately 5 to 15% less than threaded conduit. In addition, Electrunite Steeltubes affords full electrical and mechanical protection for wiring, and is widely approved.

You, too, will become a regular user of this cost-saving electrical metallic tubing, if you will but give it a fair trial on one of your installations. And, because of the economies it makes possible, it will in turn repay you by aiding you to obtain jobs on close competition. Ask the electrical supply house carrying genuine Electrunite Steeltubes to give you comparative figures, or write us.





Patent No. 1,962,876

Knurled inside finish available in ½", ¾" and 1" sizes

Electrical Division

Steel and Tubes *Inc.*

WORLD'S LARGEST PRODUCER OF ELECTRICALLY WELDED TUBING

CLEVELAND . . . OHIO

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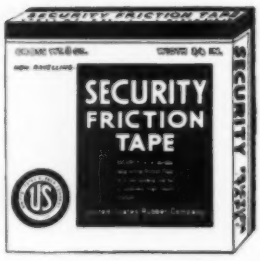
"U.S." Friction Tape
for quick, neat, permanent jobs

Holdtite – Security – Relio. Here's a line of friction tape and splicing compound that offers you quality merchandise at competitive prices. A line backed by the world's largest producer of rubber. Popular with electrical contractors everywhere.



Specify "U.S."
when ordering tape through your jobber.

United States Rubber Products, Inc.
1790 Broadway . . New York City

United States Rubber Company

vance. Their design eliminated the need for special box supports or saddles, and once bolted in place they did not require further attention during the progress of the job.

Support for Temporary Feeders

An inexpensive and reusable multicable support can be provided to keep temporary feeders safely insulated overhead and also away from walls, pipes, columns, and moving construction machinery such as hoists and

their cables. Steel plates are punched oversize to accommodate the groove diameter of two-piece porcelain spool-insulators. These plates are sheared along the center-line of each row of insulator holes, and are then drilled for stove bolts to permit these separated sections to be joined together by overlapping them, after the insulators are in place in these plates. By drilling uniformly-spaced bolt holes along all sides of these plates, it is possible to assemble these plates in multiples so as to expand their capacity to accommodate additional cables from time to time. Broken insulators may easily be replaced, and these assemblies may be fully salvaged for use on successive jobs.

The bolted assemblies may be suspended from the ceiling or other structural members by means of iron wire, perforated iron or light flat iron. The usual spool diameters are 2 in. inside. In the 6-hole assembly illustration, there are three 500,000 c.m., three 3/0, three 1/0, and one No. 12 duplex conductors. This method is employed by J. Livingston

For a GOOD JOB and a GOOD PROFIT

Four favorites — tested and proved

"HANDI-LUGS" *(Solderless Connectors)*

Three Types:
STANDARD:
STUD TERMINAL:
2 WAY CONNECTOR.

¶ No blow torch . . no solder and iron . . . no tape . . no paste . . but a *definite, assured contact.* ¶ Eight sizes of "Handi-lugs" of all 3 types, care for all wire sizes from 1,000,000 C. M. to No. 14 Wire. ¶ Each size adjustable to several wire sizes and rated in amperes. ¶ The time saving feature of "Handi-lugs" is also an important factor when compared with the more conventional method of soldering lugs to cables — and waiting for them to cool. ¶ See pages 153, 153A, 153B of Cat. 16.

No. 24111 . . Type "D" *For Oil Burners*

List each, $1.90.

30 Amp., 125 Volt, Plug Fuse, 2 Wire. single fuse, single blade. ¶ Porcelain base. ¶ For *Oil Burners* and a score of other applications including lighting circuits. ¶ Entire switch unit is removable from the box, insuring minimum installation cost. ¶ Compact in size, (Box 3 11/16" x 6" x 3 5/8") substantial in construction. ¶ Competitive in price. ¶ For extra large wiring space a similar switch is available in a larger box at the *same price* — and catalogued as No. 23111. ¶ Both described in Bulletin 118 — Sent on request.

"T.T." Motor Starters *(Thermostatic Tumbler)*

¶ With Thermostatic Overload Protection. ¶ For motors 1 H. P. and below. ¶ Single and double pole. ¶ Heater units inter-changeable. ¶ Fits standard deep box. ¶ Can be furnished with plate for flush mounting. ¶ Contacts are silver to silver. ¶ Switch unit completely enclosed in Bakelite case. ¶ It will stand a heavy starting load or overload for a brief space of time without tripping but will trip before the overload can damage the motor. ¶ Low in price— no maintenance cost–and full protection. See Bul. 119.

"T.M." 7½ Motor Starter *(Front Operated)*

¶ With Thermostatic Overload Protection.

¶ Operates on any voltage from 110 V. A.C. to maximum of 550V. A.C. for motors rated up to 7½ H.P., 2 and 3 Pole. ¶ Duo-break contact construction reduces arcing to a minimum. ¶ Safe to "jog" the motor. ¶ Silver to silver contacts. ¶ Front operation construction allows for close ganging. Also available side operated. ¶ After overload trip, the starter automatically resets. ¶ Full description in Trumbull Cheer, May issue and page 44, Catalogue 16.

SATISFACTION AND PROFIT WITH TRUMBULL

THE TRUMBULL ELECTRIC MANUFACTURING CO.

PLAINVILLE, A GENERAL ELECTRIC ORGANIZATION CONNECTICUT

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The TORK CLOCK COMPANY, Inc.
Mount Vernon, New York

.....1935

Please tell me how to sell Tymits, which I understand are high grade, electric clock driven switches and receptacles, combined in beautiful chrome and bakelite cases in black or walnut finish. I am particularly interested in:

☐ the 6 ampere plug-in Tymit retailing at $9.75.

☐ the 15 ampere installed Tymit retailing at $11.50.

☐ dealer's discounts, descriptive folders and advertising helps for my use.

Name of firm.....

Address..... City.....State.....

Jobber Reference .....

and Co., New York, N. Y., for the temporary feeders in the new Italian building, Rockefeller Center, New York City.

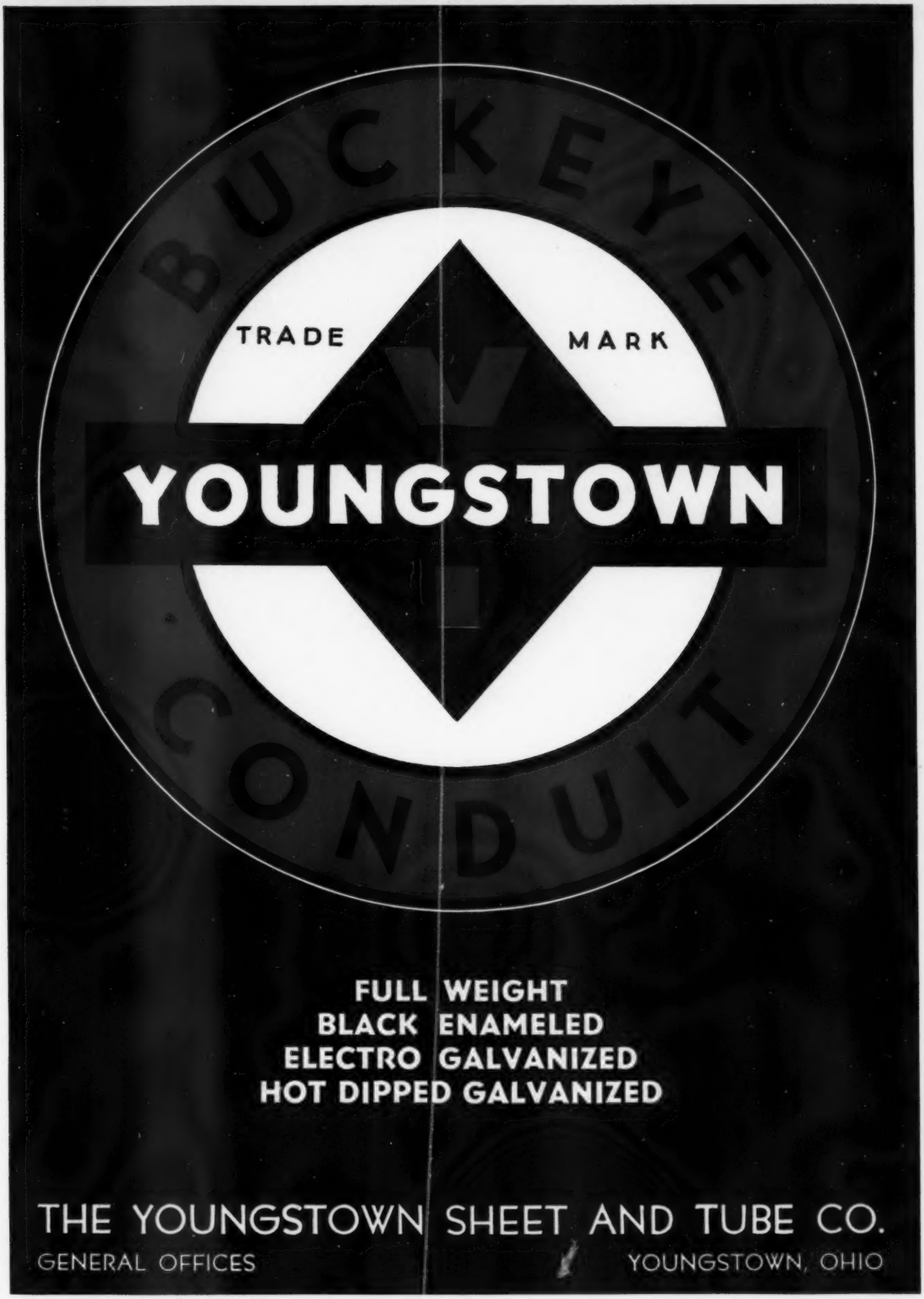
Patch Drawings Save Time

"Patch drawings" are little letter-size sections of a large drawing, which show to exact scale several bays of large jobs. This method is followed by the H. P. Foley Company, Inc., of Washington, Baltimore and Philadelphia to cut down the confusion and unwieldiness of handling large drawings out on the job. Likewise, such small drawings may more readily be revised to show changes which may occur in each area. When an entire floor is completed, these small drawings may then be assembled for making a corrected plan of the entire area.

Wall Sleeves for Exposed Armored Cable

In wiring a Long Island "model" home, the exposed armored cable lighting panelboard feeder at the left,

and a short stubdown of branch circuit cable at the right side of door, had to be run exposed in the garage. These runs were kept plumb and neat between their point of box connection and where they emerged from the wall, by encasement in short lengths of rigid conduit. These conduits were strapped to the wall in two places. This method saved Whitson McKay, Inc., Garden City, N. Y., the change from cable to conduit near the ceiling, the introduction of unsightly exposed junction boxes, and the need for changing to spliced rubber-covered conductors for the short distances involved.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HOT DIPPED GALVANIZED
THE YOUNGSTOWN SHEET AND TUBE CO.
GENERAL OFFICES
YOUNGSTOWN, OHIO

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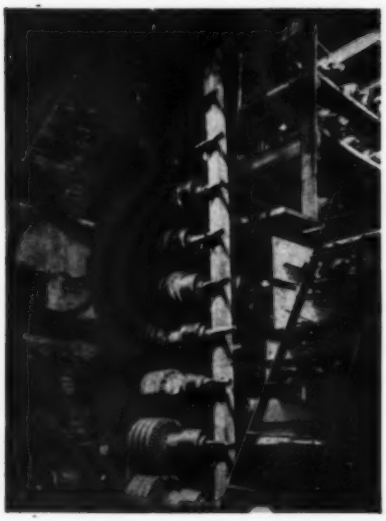
Service Shop . . . Practice . . . . . .

Space-Saving Armature Storage

A rigid rack for storing spare armatures was made by Warfield and Sanford, Inc., Washington, D. C., which occupies a minimum amount



of valuable space, yet keeps this equipment accessible for quick delivery on emergency break-down calls. Vertical supports of 4-in. by 4-in. timbers are bolted to the ceiling joists and to the floor, these timbers being fitted with ¾-in. conduit nipple pegs for supporting the armature shafts.

Motor Conversion Results in 33 Per Cent Annual Saving

By converting two 400-hp. wound-rotor induction motors to synchronous motors, as part of a modernization program involving the main-line-shaft drives, a flour mill, located at South Vallejo, Calif., is now realizing savings of about $300 a month—an annual return on the investment of approximately 33 per cent. The savings are due partly to the power factor improvement made possible by the operation of the equipment at 0.8 leading power factor and partly to improved efficiency. In addition the motors may now be considered as practically new, although they had been operating continually for about 15 years. The conversion was made by the San Francisco service shop of the General Electric Company, after new stator coils and rotors had been furnished by the factory. The work of changing over, including installation of new control equipment and exciters, was so organized that it was necessary to take each unit out of service for only about ten days, thus minimizing production losses. Although the power-factor improvement could have been obtained through the use of capacitors, change-over of the motors was found to provide a greater economy in this case.

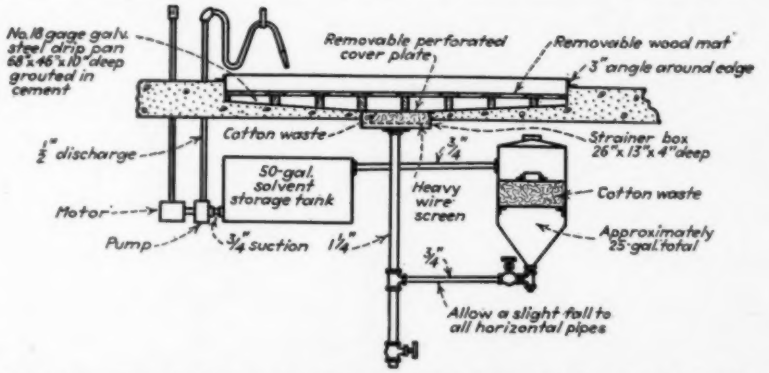
Job Record-Name Plate

Name plates which contain the shop order number are installed on all important motor repair jobs done by Venino Bros. & Co., Inc., of Newark, N. J. The design of these name plates provides space for stamping

thereon the essential machine rating details. Therefore, a motor or generator that has been so re-wound or re-connected as to alter its original rating is correctly designated in accordance with its new characteristics. The shop order number that appears on these name plates speeds up reference to old repair records, when previously repaired motors are again brought into the shop.

Oil and Grease Cleaner

Quick and thorough cleaning of electrical equipment before beginning to repair it saves enough time and muss to have warranted the recent installation of a complete mechanical cleaning outfit by the Charlotte Electrical Repair Company, Charlotte, N. C. This outfit is used on repair jobs having good windings but which need to be cleaned of oil and grease, quickly re-assembled and again placed in service.



Because the solvent is not considered injurious to the insulation, many small jobs such as electric drills, etc., can be cleaned, blown partially dry with air pressure, repaired and reassembled, and current applied immediately without having to bake the windings. It is estimated that this method results in doing a much better job in about half the time that would be required by other equally reliable cleaning methods.

Fuse Chart—FREE

A handy guide to selection of proper size fuses at a glance, for the adequate protection of motors. Ask for Fuse Chart No. 18.

The secret of Jefferson Super-Lag performance is in the lag plate on the Super-Lag link. This plate delays the normal fuse action, provides a time interval or lag by absorbing temporary heat rise. This time-lag prevents the fuse from blowing on harmless temporary overloads—saves needless STOPPED Time and link replacements.

The high cost of STOPPED motors is a sales opportunity for you. Show customers how they can eliminate needless stops which disrupt schedules, stop men, throw production out of step by using fuses which protect TIME along with the motors.

Jefferson Super-Lag Renewable Fuses do not stop motors needlessly. They do not blow the moment current rises —do not blow if the overload is only momentary. But they operate positively before the actual danger time is reached. It is this "wait" which eliminates needless STOPPED TIME—which protects TIME along with motors.

Sell protection against needless stops as well as against motor burnouts by pushing Jefferson Super-Lag Fuses. Made in all capacities, knife-blade and ferrule types.

JEFFERSON ELECTRIC COMPANY
Bellwood (Suburb of Chicago) Illinois
Canadian Factory: 535 College St., Toronto

JEFFERSON
Super-Lag RENEWABLE FUSES

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CRESCENT WIRE

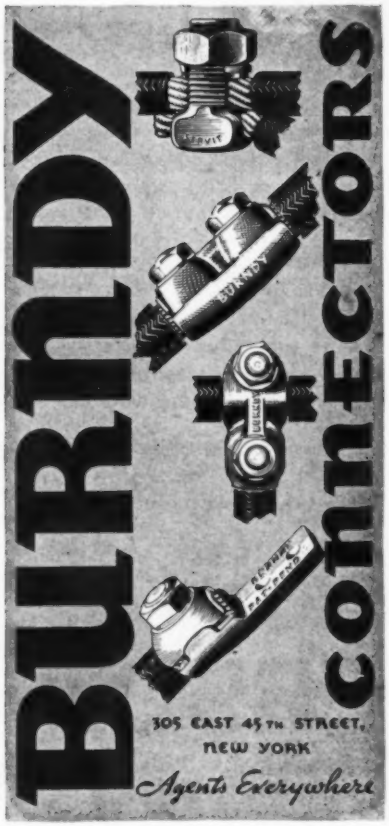
easier to install and always on the job!

Dependable quality and consistent performance are the things you find in CRESCENT WIRE & CABLE — quality that brings more and bigger installations — performance that means economy and satisfaction to all.

RUBBER SHEATHED CORDS
SIGNAL CABLES
CONTROL CABLES
LEAD COVERED
VARNISHED CAMBRIC
PARKWAY CABLES
BUILDING WIRE
FLEXIBLE CORDS
WEATHERPROOF WIRE
MAGNET WIRE

and all kinds of Special Cables to meet A.S.T.M., A.R.A., all R.R., Government and Utility Companies specifications.

CRESCENT
INSULATED WIRE & CABLE CO. INC
TRENTON, NEW JERSEY



Plan ahead for the

SEPTEMBER

CONVENTION ISSUE

ELECTRICAL CONTRACTING

The first convention of electrical contractors since 1932 **will be held at the Hotel LaSalle in Chicago, September 23rd-25th.**

"Electrical Contracting" will tie in with an outstanding convention issue, with special emphasis on selling. Copies will be in readers' hands a few days before the convention, and there will be extra distribution at the convention.

Special advertising rates for this issue only.

ELECTRICAL CONTRACTING

330 West 42nd St., New York, N. Y.

A motor-driven circulating pump is used to provide hose nozzle pressure for cleaning the equipment with a commercial solvent known as Varsol. The sediment-laden solvent is re-claimed since the equipment cleaning is done on a platform of wood slats which has a drip pan below. A piping system connects from a strainer box below the drip pan to a bottom-supplied settling reservoir, thence by gravity over-flow to a storage tank to which the circulating pump is connected. The hose station and pump motor control switch are conveniently located on the wall adjoining the cleaning platform.

Sediment which accumulates in cleaning dirty motors, transformers and starter cases is mainly strained off in a waste-filled box located directly below the drip pan or hopper. Regular cleaning out of sediment is done at this point. Further sediment accumulates in the vertical pipe below the strainer box, therefore, an extra length of pipe, which serves as a trap, extends downward below the horizontal pipe which leads to the settling reservoir. A trap cleanout valve is provided in the bottom end of this extra vertical section of pipe. The bottom of the settling reservoir has also been equipped to permit the occasional removal of sediment. The foregoing arangement causes the final accumulation in the storage tank of reclaimed solvent that is reasonably devoid of foreign matter.

This outfit was largely made out of old stock materials of little value, so that the actual cost of purchased materials and labor was less than $75.00. The pump has a ¾-in. suction and ½-in. discharge, and with its 1/6-h.p., 1,750 r.p.m. motor it delivers 2¼ gal. per minute. This pressure has proven satisfactory, although it is claimed that a higher rating would be desirable. A ½-in. oil-resisting rubber air compressor hose and nozzle is used.

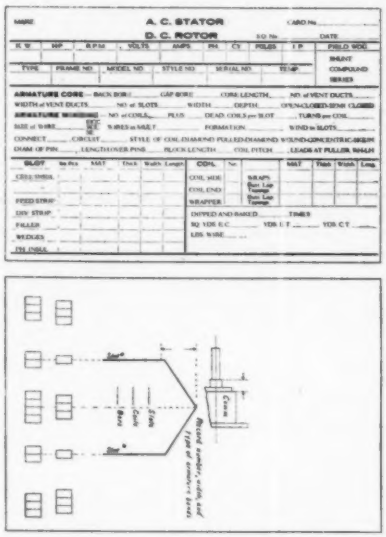
The advantages that are to be derived from solvent cleaning methods under pump pressure must be carefully considered from a fire hazard standpoint. This system should be designed only after consultation with local insurance engineers.

Motor Winding Data Record Card

The procurement of exact winding and armature data for various motor repair jobs is simplified under a record system which is employed by the Boustead Electric & Manufacturing Company, Minneapolis, Minn.

A method that has been used faithfully by this firm for many years has permitted the accumulation upon separate 4-in. by 6-in. data cards of the specific detailed data pertaining to a wide list of makes, types and sizes of motors. A diagram on the reverse side of data card provides a method of schematic commutator description.

Each motor job brought to their



Two sides of data card

shop is checked for an office winding data card. If the motor is of a type not of record, a complete record is made thereof, and a data number is assigned to the completed card. This card is filed numerically, while the duplicate thereof is filed under a manufacturer's divisional file. On jobs for which data cards are already on file, a record is made upon the job work order indicating the index number of the winding data record card used.

By having carefully followed the above practice, there is seldom a delay in commencing work on important rush jobs due to the lack of important data, which might otherwise need to be obtained through correspondence. Furthermore, there is little likelihood of errors in windings or connections by reason of having a positive record of the correct design for the detail involved.

WHAT'S in a name like, for instance, The Commercial Electric and Machine Co., Newark, N. J.? Ernest T. Bergquist claims that the war-time pressure for machine work caused him to temporarily branch out from industrial motor service work. This required an addition to his firm's name that is still retained.

Be sure its "Westinghouse" and you're sure it's RIGHT

. . . wherever you need signaling transformers for bells—gongs—sirens—time clocks—annunciators—signaling systems.

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Please send copy of booklet "The Brush Phase of Motor Maintenance."

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Code Chats . . . . .

Questions and answers relating to the interpretation of the National Electrical Code . . .

Conducted by F. N. M. Squires

Chief Inspector New York Board of Fire Underwriters

Types of Conductors for Gas Tube Work

Rule 3803-c states that high voltage conductors shall be approved for gas tubes. What type of wire is this?

Wires for this use should be insulated to stand the high voltage encountered, 15,000 volts. Such wires are listed by Underwriters' Laboratories under

Wires: Gas Tube Sign Cable

and will be found on page 221 of the May, 1934, issue of the Laboratories' List of Approved Appliances.

Signs

What is meant (3805-a) by — signs on walls and open ground?

This rule refers to the "billboard" type of sign rather than to the ones which are attached to a building and are over the sidewalk.

I understand that this rule is only for outline wiring of sign and lettering. Would open wiring be allowed for the feed from building to sign?

If not subject to mechanical injury or unless restricted by local rules, open wire could be used as a feed.

Branch Circuit Protection

On a 2-circuit, 3-wire service with grounded and identified neutral, if 15-amp. fuses are used in the mains, is it necessary to insert additional branch fuses at the head of each of the branch lines? In one particular case, they are using No. 8 mains, and No. 14 for the branches with one set of 15 amp. fuses in the main only.

Inasmuch as 15 amp. fuses are placed in the main line, although these mains in this case are No. 8 wire, the No. 14 circuit wires are sufficiently protected by the 15-amp. fuses and no further fuses are required at the point where the No. 14 is tapped from the No. 8's.

This is covered by Rule 806-c in which a conductor is properly protected when there is a fuse of the proper size in series with it. In this case the 15-amp. fuses afford the proper protection for the No. 14 wires.

Or, it is also covered in 806-d-1, which says that a smaller conductor is properly protected when the fuse in a larger wire ahead of the smaller one is of the right size to protect the smaller one.

Panel Board Capacity

A panel board is made with eight 100-amp. 3-pole fused knife switches for use on a 3-phase 4-wire system as a distributing panel for lighting. The bus bars of this panel are of copper bar ¼ in. x 1¼ in. Are the bus bars of sufficient carrying capacity?

If the purchaser of such a board contemplates using a 100 amp. load on each of the switches, the bus bars would not be of sufficient capacity.

Advocates Attention to Reinspections: David Berman of Berman Brothers, Mt. Vernon, N. Y., values highly all leads which involve the correction of defective wiring. A local industrial plant service replacement order for $360, which resulted from reinspection, brought this contractor over $2,000 in wiring jobs within this one plant during the ensuing year—all from selling the owners upon the advantages of safe and adequate industrial wiring over the entire property.

The bus bar capacity is determined by the cross sectional area of the bus and is figured at 1,000 amp. per sq.in. In the case mentioned above (¼ in. by 1¼ in.) the capacity of the panel is 312½ amps.

The Laboratories in approving such a panel would require that the ampere capacity be stamped upon the bus and if it were so marked they would approve it for this capacity, but only for this capacity. This would then allow for but an average of approximately 40 amp. per switch instead of 100 amp. each and 60-amp. switches would be large enough. The purchaser, in ordering this panel, should have specified for the capacity he wanted as a guidance for the manufacturer.

In the case of the panel board mentioned above it will be up to the inspector to determine whether or not the panel is of sufficient capacity for the duty to which it will be put on its particular job.

Room Lining for Dusty Location

What is considered non-combustible material (3204-b) for lining a dust-tight room for switchboards?

Metal or concrete would meet this requirement.

Do you know of any service equipment that is made that is dust-tight? Most of them seem to be just for explosion-proof places. One company told me there was not enough call for it.

In general, devices approved for Class I locations would be acceptable for Class II locations.

Capacity of Service Equipment

If a one family house has only six branch circuits, the service switch under 405-b-2 can be omitted if approved circuit breakers are used, and then the last part of 405-i-3 states that the total rating of the service equipment canont be over 100 amp. Does this mean that the meter or the total ratings of the circuit breakers must not be over 100 amp.?

The Code deals with the necessary service equipment which consists of the service switch and protective device (fuse or circuit breaker).

Rule 405-b-2 permits the omission of the service switch where not more than six branch circuits in a single family house are protected by circuit breakers provided certain conditions of circuit breaker arrangements are complied with. There are no limitations to the ampere capacities of the circuit breakers under

SANGAMO TIME-SWITCHES

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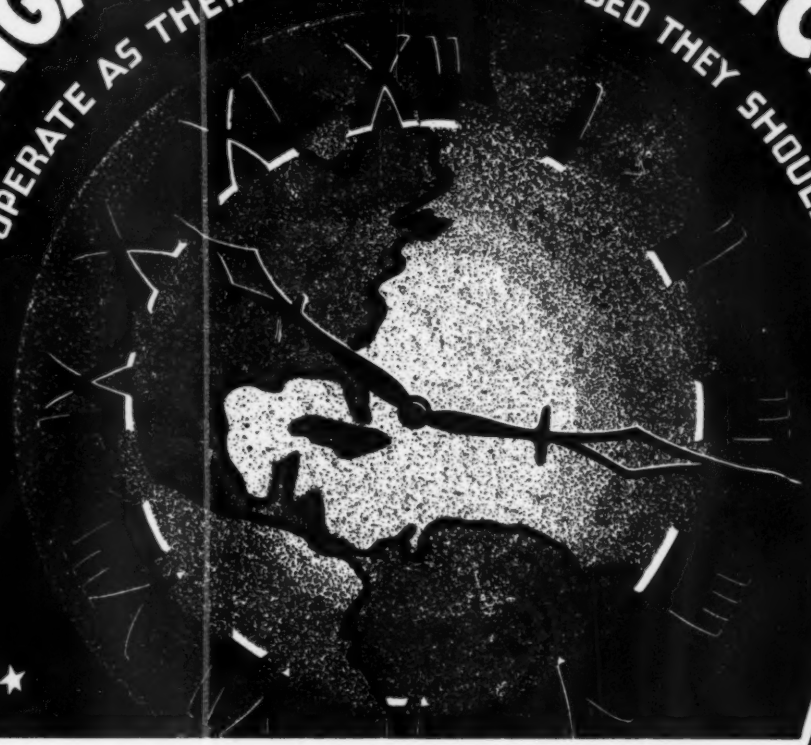

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Greenlee Hydraulic Conduit Benders insure profits, because they bend conduit quicker and easier than by other methods. In addition, they make smooth, even bends, eliminating many fittings and making it easy to pull in wire and cable. They are easy to take to the job, too, because they are readily portable.

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Greenlee Knockout Punches and Cutters are time savers and profit makers, because they make it easy to enlarge holes in switch boxes, cabinets, etc. They form clean-cut holes quickly and accurately, without any reaming or filing.

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this arrangement unless it is desired to use a meter or meters ahead of the circuit breakers.

If it is desired to use a single meter ahead of the six, or less circuit breakers, the sum total of the circuit breaker capacities must not exceed 100 amp. If a meter is to be placed ahead of each individual circuit breaker each breaker may be of 100 amp. or less capacity.

Signalling Transformers

I am using a bell transformer for signal work that would be considered in 6001, Class 2, paragraph 3, as it has 35 volts on the secondary at not over one ampere.

(1) Would it have to be approved, and if so does this mean it would have to have the Laboratories' stamp of approval?

Yes, to receive recognition by an insurance underwriting organization it would have to be approved by Underwriters' Laboratories or by the Factory Mutual Laboratories for the mutual companies.

The individual transformer would not bear a label of the Laboratories as these devices are listed under the re-examination service. It would have to be listed in the Laboratories' "List of Inspected Electrical Appliances."

(2) Is it necessary to ground the transformer case?

The Code does not require that a signalling transformer case be grounded.

(3) Must there be an open space between transformer and wall?

No. Such a transformer may be mounted directly on the wall.

(4) As I interpret 6001, Class 2, paragraph 3, no fuse is required on the primary or secondary for this class of work (35 volt, 1 amp.). Is this correct?

If the transformer has an inherent current limiting characteristic so that the secondary current on short circuit does not exceed a certain set limit, no fuse is required.

Conducts Nation-wide Operations: Making a specialty of large private telephone systems has resulted in the Gustav Hirsch Organization of Columbus, Ohio, performing work for U. S. Federal Prisons at Alcatraz Island in San Francisco Bay, McNeil Island, Puget Sound, New Orleans, La., El Reno, Okla., and at other similar institutions. These systems which often provide up to 300 stations, consist of a private telephone exchange, sentry alarm stations and special control features for prison operations. Starting in the contracting business in 1902 Gustav Hirsch has at the present time an office and engineering staff of sixteen persons. A local electrical contracting business is carried on, while other departments conduct an engineering practice for telephone and other utilities in field survey and appraisal work, the construction of telephone lines, street lighting and traffic control systems, and the sale of special items, such as neon tubing and signs, complete refrigeration systems and other equipment. A separate division of the organization specializes in the design, sale and erection of neon displays.

Grounding Primary of Signal System Transformers

What is the reason in 6004-e for permitting transformers for signal sytems only when the primary is grounded. How is this done?

This rule permits the use of transformers only when the circuit to which it is connected has one of the wires grounded. This is to insure that the voltage across the primary will not exceed its normal value and that, therefore, the secondary voltage of the transformer will not exceed its proper value.

This is accomplished by connecting such a transformer to a circuit which contains a grounded conductor.

Metallic Tubing as Grounding Conductor

Is steel tube permitted as the ground conductor for the combined service conduit and interior metal raceway?

Yes, electric metallic tubing is considered as meeting the classification of "steel pipe" as mentioned in the sixth line of 908-f.

If the system (neutral) grounding conductor is bonded to the metal raceway from the neutral bus on the service switch, would the steel tube through which this ground wire is run to the water system be considered as the service conduit and raceway grounding conductor? An adapter is used with a groundulet fitting for the ground connection.

Yes, the electric metallic tubing through which the grounding conductor is run can serve as the equipment grounding conductor providing it meets the requirements of 908-l.

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ELECTRICAL CONTRACTING

S. B. WILLIAMS, Editor

Convention

WHAT is probably the finest program for a convention of the National Electrical Contractors Association is that which appears in the N.E.C.A. News section of this issue. Aside from its balance, wide interest and very practical nature, it might, in many respects, serve equally as well for a program for association effort. We urge our readers to study that program, and then make plans to attend the convention in Chicago in September.

—◈—

Labor Club

THERE is no question but what contractors doing the larger work very much want some code of competition, whereby they can be assured that work will not go below cost, that it will be taken fairly and that each competitor will be on the same basis, so far as conditions are concerned. The difficulty has been to make such arrangements stick, because of the ineffectiveness of the policing or penalties.

The agreements with respect to competition do not have to be illegal in order to be effective. By voluntary action, which in a sense amounts to a contract, contractors can agree to file bids and stand on those bids, not to sell below cost, pay certain wages and work certain hours, etc. If one breaks such a contract, his competitors have the right to appeal to the courts for the protection of their rights.

This is the legal way, but to some groups it appears to be too slow and indirect. Some other kind of police power that would make the agreement stick has been felt to be necessary, and the suggestion comes that organized labor be used as a club to keep wavering contractors in line. Under this plan the contractor who did not behave would find his jobs struck.

There is no question as to the effectiveness of a strike as a punitive weapon, but we question the advisability of such collusion, for collusion it would be.

There is no question but what such action is illegal, and if proven, will be stopped by the courts and penalties inflicted. Secondly, such a program is open to all kinds of abuse and racketeering. Thirdly, by using labor in that connection, the contractors put themselves wholly and completely within the power of the unions.

Any association that feels it can obtain security through collusion of that nature should remember that the price is generally much more than the item is worth.

We appreciate the problems that the contractors are facing, and realize the necessity for some corrective action. It is better, however, to continue to live under these conditions and work out a program that is lawful, instead of selling one's birthright at the first pangs of hunger.

—◈—

Reinspection

FOR years we have been hammering away at reinspection, primarily, of course, because it represents a large, virtually untouched, market for wiring. Within the last two years we have seen a growing interest in this subject. Where it has been tried, it has produced results.

Unfortunately, however, there are many stumbling blocks that make the course of reinspection sometimes rather rough. In the first place there are still a great many inspectors who are not sold on reinspection, because they feel that it is "too commercial." And then there are the contractors who will not follow up defect notices, or who, if they do, will try to convince the customer that he can get along with far less than the inspector has recommended.

For this latter group we have nothing but contempt.

The first group, on the other hand—the inspectors—must just be convinced that reinspection is in the interests of public safety. That is proper, but, on the other hand, the fact that reinspection has a commerical angle should not make it tainted.

Reinspection, when properly sold to the public, can make the electrical inspector a much more important man locally than he was before. It can give him a new place in his community.

We, therefore, say to inspectors, forget the com-

mercial side. Judge reinspection solely on its merits. If you find an opportunity there to do a public service do not disregard it, just because it might also be doing a commercial service.

Wagner Bill

THE Wagner Labor Disputes Bill, giving to employees the right of collective bargaining by representatives of their own choosing, has passed both houses of Congress. It was written to prevent labor disputes from obstructing the free flow of interstate business.

While past decisions have held that certain operations purely within a state did affect the free flow of trade beyond the borders of that state, it is difficult to see, in view of the recent Supreme Court decision invalidating N.I.R.A., how the Wagner Bill can be applied to electrical construction. The wiring in a building is so definitely done within one state, that until there has been a competent decision, it would seem safe to assume that the Wagner Bill does not apply.

Labor Shortage

IT HAS always been difficult to sell fur coats in July, and fans in January, despite the fact that the buyer would probably get the best service and the best price at those times. It seems to be equally difficult today, with all of the unemployment that exists, to realize that we are approaching a period of labor shortage, and that this is an excellent time to start to prepare for it, because of the selection possible among our unemployed younger men and boys from high school.

What has happened during the last five years, while building construction was falling off? Apprenticeship plans have been allowed to peter out, so that the number of new men coming into the industry has been virtually nil. During that time the average life of the men in the industry increased by five years, so that a certain percentage of workmen are no longer available, because of age. Others finding no work in the electrical business, have sought employment elsewhere, and have permanently left the electrical trade. Thousands have found work with industrial plants, and will be satisfied to remain on a basis of permanent income, rather than again face the struggle for work, though the rate per hour may be greater in construction. Others have died, or have become incapacitated through sickness or injuries, while many thousands more have lost their skill through being out of practice.

The ranks of the army of electrical workers, therefore, have been considerably thinned. Some plans must be made for recruiting young men for this kind of work, in order that a severe shortage shall not develop.

Performance

ELSEWHERE in this issue is an article on the selection of safety switches, which is an abstract of a paper recently read before the Western New England Chapter, I.A.E.I. Factually the paper tells the reasons for horsepower rating of switches, and the reasons for using switches so rated on motor circuits instead of general purpose switches. That, in itself would have been sufficient for any paper, because it is information that has been badly needed, but the paper besides opens a line of speculative thought.

There is a decided lack of knowledge about the proper use of electrical material. Competition has brought cheaper and cheaper lines, with the result that far too much of the selling has been on the basis of price, and too little on the basis of accomplishment.

The inspectors see this, of course, because they are out in the field and have an interest only in safe performance. It is not surprising, therefore, to find them taking up such subjects in their meetings. In fact, it is hoped that they will continue to treat of such subjects.

New products come on the market to do a certain job, and the thought of the manufacturers who introduce them is constantly that of improving the product. He markets the product on the basis of quality and performance, and builds a market. The product is no more than proved good, than a cheap competitive line appears. If a market can be built on the basis of quality, it can be maintained on the basis of quality.

And there should be no room in the electrical industry for cheap materials. Not only are they a distinct hazard because of their weaknesses, but they introduce the element of unreliability. Too much is dependent upon electricity to permit any element of unreliability to enter. Customers can understand that and are willing to pay for it. Let the industry sell performance first, and price will take care of itself.

UMI

N.E.C.A. News..

Material for this department is supplied by the headquarters staff of the

National Electrical Contractors Association

420 Lexington Avenue, New York, N. Y.

President	Vice President	General Manager
L. E. Mayer	E. N. Peak	Laurence W. Davis
569 West Van Buren St.	1603 West Main St.	420 Lexington Avenue
Chicago, Ill.	Marshalltown, Ia.	New York, N. Y.

New Budget

As the result of the cessation of Code activities, the N.E.C.A. has found it necessary to revise its budget. Much of its overhead had previously been shared with the Code Authority. The new budget is now in the hands of the Executive Committee for approval.

New Code Invited

N.R.A. has advised the Association that it will receive for consideration any proposed agreements in accordance with the revised and extended N.I.R.A. The Association, at the time of going to press, had not yet acted upon the matter.

Adequate Wiring Committee Appointed

The Association has appointed a committee to work with the Committee of the Industry to develop a handbook of interior wiring design practice. The contractors' committee is composed of: R. A. Goeller, New York; George H. McKee, Mt. Vernon, N. Y.; Edwin M. Seaman, Mineola, N. Y.; Charles D. White, Paterson, N. J.

Pipe Trades for Joint Effort to Separate Contracts

The committee on separation of contracts for government work, composed of representatives of the National Electrical Contractors Association, Heating, Piping and Air Conditioning Contractors National Association, and National Association of Master Plumbers, has prepared the following resolution for submission to each of the three cooperating national associations:

RESOLVED, That it is necessary and vital to the interests of the Plumbing, Heating and Air Conditioning, and Electrical Contracting Industries that a consolidation of their interests looking toward the formulation of a plan wherein bills will be enacted into law making mandatory the principle that the contracts for plumbing, heating and air conditioning, and electrical work be let separately from the general contract on all governmental work; and be it further

RESOLVED, That the representatives of the National Associations for the Plumbing, Heating and Air Conditioning, and Electrical Contracting Industries recommend that a plan be adopted by each of the three national associations, that all details leading to the introduction of bills into the Senate and Congress for the January 1936 session be prepared, that a program be adopted by each of the three national associations wherein their memberships will be advised of this movement, and that the members be further advised to contact their senators and representatives so as to get favorable action on these bills when presented in the Senate and Congress.

RESOLVED, That it is understood that these resolutions be adopted subject to the ratification of the three National Associations and that the committee should be instructed to proceed after such ratification is received.

Code Authority in Liquidation

As a result of the N.R.A. decision of the Supreme Court, the Code Authority for the Electrical Contracting Industry has closed its offices and dismissed its entire staff. So far as possible it is liquidating its obligations.

A letter has gone out to all contractors who had paid assessments, asking for voluntary contributions to help defray any deficits. A generous response is being received, although it is not expected that it will be sufficient to completely liquidate all indebtedness. That which remains unpaid will, necessarily, be absorbed by the N.E.C.A.

Convention Program Outline

A broad program is being planned for the National Electrical Contractors Association Convention to be held at the Hotel LaSalle, Chicago, on September 23-25 inclusive, designed to chart the way for national, state and local organization activities to carry forward the advances made by the industry under code regulation in the past two years.

Six basic divisions of industry problems have been set up under which the discussions will be directed, as follows:

1. Regulation of Industry.

A. Voluntary Agreements for Self-Regulation.

(1) Basic principles and trade practices desired by the industry.

(2) Contractual basis of agreements.

(3) Method of administration and support of administrative bodies.

(4) Adjudication of disputes and interpretation of provisions of agreement.

(5) Determination of violations and fixing of damages.

(6) Federal or State sanction of agreements.

B. Legislative Regulation.

(1) Basic principles of State or local licensing of contractors.

(2) How should such legislation be secured?

a. What have been our mistakes in the past?

b. What preparation should be made in advance?

c. What should be done about selling it to the public?

2. Business Development.

A. Necessity for Supplementing Industry Regulation with Business and Market Development.

(1) Where are we going to get more business?

(2) Need for close co-operation of national, state and local electrical contractors associations in developing contractors' markets.

B. Mutual Relations with Utilities and Manufacturers in Broadening Markets.

(1) Application of "mass production" principles to reduce installation costs.

C. Wiring 500,000 Ranges.

(1) Standard range wiring hook-up recommended by contractors.

(2) Recommended practices for the installation of ranges.

(3) Studies of costs as affected by varying practices in

a. Furnishing of materials

b. Distribution of jobs by utilities

c. Cost of delivery and connection of ranges.

D. New Methods of Selling Industrial Work.

(1) Guaranteeing industrial owners economies in reduced costs of operations and production.

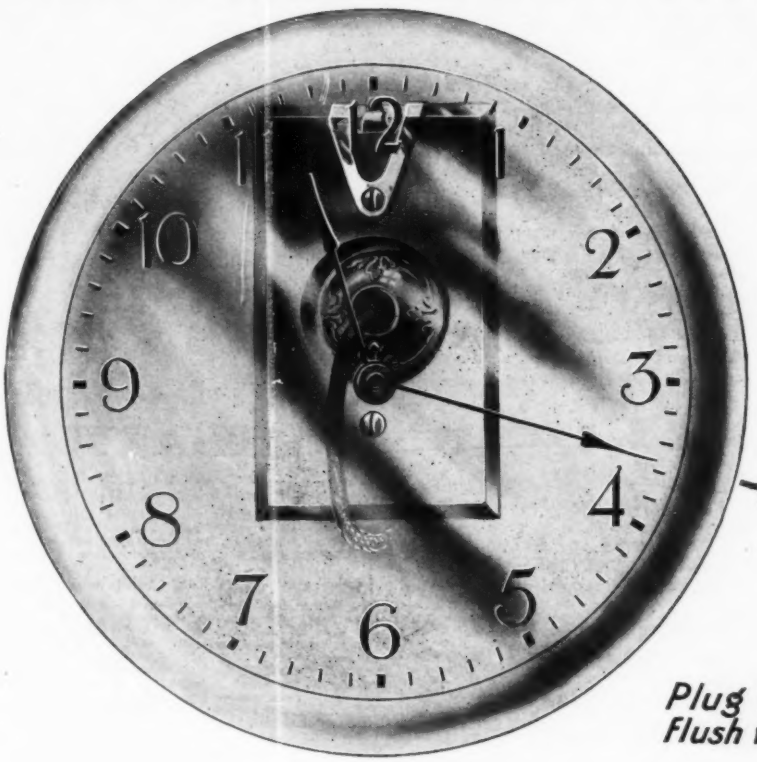
(2) Contracting engineering service for industrials with electrical departments.

E. Opportunities in Mass Selling.

(1) F.H.A. loan insurance.

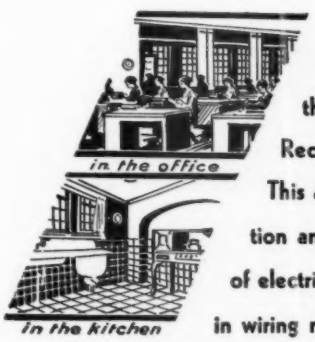
H&H *Timed to the Need!*

ELECTRIC Clock Hanger Outlet

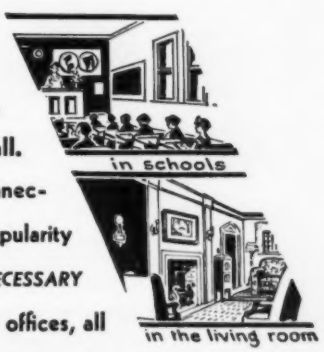


DOUBLE SERVICE DEVICE
Mechanical support
For the clock, and
electrical connection

Plug Cap goes Flush with plate



This device gets rid of unsightly cord connections running from clocks to the nearest receptacles. At the same time it gives firm support to the clock . . . Receptacle part is recessed, so plug cap is sunk flush with wall. This allows clock to hang flat over the outlet with wire connection and receptacle wholly concealed. . . Fast-growing popularity of electric clocks makes this hanger TIMELY — from now on *NECESSARY* in wiring new buildings or modernizing the old. Specify it for offices, all modern residences, schools, hospitals and institutions favoring electric time.



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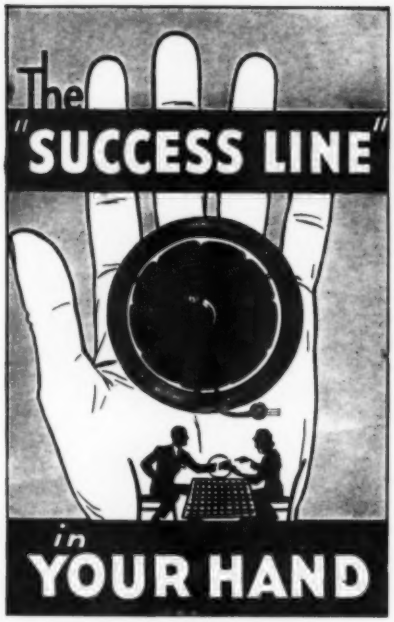

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This demonstration stand and smoke candles furnished **FREE** with initial order of 3 or more Emerson Exhaust Fans.

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NEW YORK · ST. LOUIS · CHICAGO
LEADERS IN THE FAN AND MOTOR INDUSTRY SINCE 1890

(2) Employment of salesmen by groups of competitors or non-competitors.

3. Engineering and Technical.

A. Engineering Advances in Wiring Practices and Materials.

B. Development of Standards of Interior Wiring Design.

C. Pre-fabricated Structures.

(1) How far will this development go?

(2) What will it mean to electrical construction?

D. Important Changes in 1935 Revision of National Electrical Code.

E. Proposed Rewriting of N.E. Code now in preparation.

F. Motor Specialists' Problems.

(1) Effects on motor dealers of new motor policies and discounts.

(2) Repair shop price policies, practices and methods.

4. New Industrial Economics.

A. Effect upon Electrical Contracting Industry of Important Federal Legislation.

(1) The Wagner Bill on Labor Relations.

(2) The Social Security Bill providing old age pensions.

(3) The 30-Hour Week Bill.

(4) The present N.R.A. structure.

5. Inter-Relations of Industry.

A. Relationship between Electrical Contractors, Manufacturers and Wholesalers.

(1) Progress towards adequate differentials and proper protection for contractors' service in distribution.

(2) Mutual responsibilities.

B. Relationship with Organized Labor.

C. Mutual Relationships of Special Contractor Groups of Construction Industry.

(1) Joint Committee for Separation of Contracts for Mechanical Work on Federal Projects.

(2) Need for watchfulness of special legislation affecting sub-contractor groups.

D. Co-operative Movements Within the Industry.

(1) "Safeguarding Electric Service in the Home" campaign sponsored by International Association of Electrical Inspectors.

(2) "Better Light—Better Sight" campaign sponsored by Joint Industry Committee.

(3) Business development program of NEMA.

6. National Association Structure.

A. Proposed Revision of N.E.C.A. Constitution and By-Laws.

B. Election of Officers.

C. Adoption of N.E.C.A. Program for Coming Year.

D. Appointment of Committees.

The easiest way to get ahead in electricity—

through the other man's experience as found in books

Whatever "getting ahead" means to you as an individual, there is no principle so important as backing up your brain with the other man's experience. Why spend time and effort to find out what has already been learned and put down for all to see in books? Here, for instance, are all the results of a rich experience in every stage of wiring, installation and contracting work gathered and set down for you in

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Contracting .... News .....

Georgia Contractors Organize

At a meeting of a large group of contractors in Atlanta on June 3, the Georgia Electrical Contractors Association was formed with J. M. Clayton, Atlanta, president; Norton Frierson, Savannah, vice-president; and Charles H. Whitehead, Atlanta, secretary and treasurer.

The purpose of the association is to take up, as near as possible, where the N.R.A. Code left off in the maintenance of minimum wages and maximum hours, as well as the elimination through cooperation of unethical competitive practices.

To further this program, the state association is encouraging the formation of local associations in each city or town of any size.

The next meeting is scheduled to be held in Macon on July 15. For the time being the meetings are open only to contractors. All matters of cooperation with other branchs of the industry will be handled through committees.

The executive committee includes, in addition to the above officers, the following: Harold Van Waller, Albany; Malcolm S. Cone, Rome; Charles Ludwig, Dublin; E. J. Harris, Athens; Derondo Levy, Columbus; Harry Gilham, Lagrange, and Joseph McNeil, Augusta.

Lighting Program Now in Third Year

The Better Light-Better Sight movement is now beginning its third year, with a new approach to the problem, namely a plan for light prescriptions to be given by professional eye examiners. New light and sight instruments to help the examiners are now available.

The Mazda lamp manufacturers have also engaged to underwrite a $100,000 advertising program in which they will match dollar for dollar with the portable lamp manufacturers. It is expected to start the campaign at the time of the summer lamp show in New York in July.

To encourage better lamp designs, the National Better Light-Better Sight Bureau is offering twenty-four prizes for the most artistic and decorative designs of portables complying with the I.E.S. specifications, and bearing the certificate of compliance.

The bureau reports that its 1935 goal of one million I.E.S. lamps is in a fair way to be realized.

List of Approved Products

The May 1935 list of electrical equipment and appliances approved by Underwriters' Laboratories is now available.

New York Contractors Favor Code Legislation

The annual meeting of the New York State Electrical Contractors and Dealers Association, held at Big Moose, June 17, 18, 19 and 20, adopted a resolution calling for the enactment of legislation permitting state codes of fair competition.

The officers elected are as follows: E. C. Brown, Rockville Center, president; Walter Langdon, Utica, first vice-president; S. J. O'Brien, New York, second vice-president; James F. Burns, Schenectady, treasurer; Herbert F. Janick, secretary; board of directors, A. Lincoln Bush, New York, chairman; L. W. Kiesewetter, Syracuse; A. A. Tuna, New York and E. G. May, Albany.

Father-and-Son Firm Expands: After over thirty years in the commercial and industrial contracting business, the Chas. E. Tull Co., of Philadelphia, Pa., now offers its customers motor repair service as well. Mr. Tull, who is standing with his son, considers this department which was opened a few months ago necessary to hold old accounts, because they seem to have more repair and reconditioning problems than new wiring jobs.

Wiring on the Air

While appliances, refrigeration and lighting have often been brought to the public by radio, it was not until recently that wiring and the electrical contractor were the subject of a nation-wide broadcast. On its Sunday afternoon program "What Home Means to Me," the General Electric Company, through its Vice-President, Charles Wilson, told the public about adequate wiring.

After pointing out wiring modernization opportunities, Mr. Wilson said:

"Whether you modernize your existing wiring system or are planning wiring for a new home, be sure to provide for future expansion of electrical services. It's much more economical for you to have your electrical contractor install a complete system while he is on the job.

"Your local electrical contractor will be glad to make a thorough inspection of your wiring system and then to recommend desirable additions or changes. Every community has experienced and competent electrical contractors whose judgment and advice you can rely on. Consult with one of them next week."

To Suggest Rural Line Standard

An announcement has been made by M. O. Swanson, chief engineer, Rural Electrification Administration, to the effect that R.E.A. will soon suggest a few standard types of line construction.

"It is not, of course, our belief," said Mr. Swanson, "that we can redesign the products of the electrical industry, but we do hope that it will be possible for us to supply and to standardize on a few types and designs.

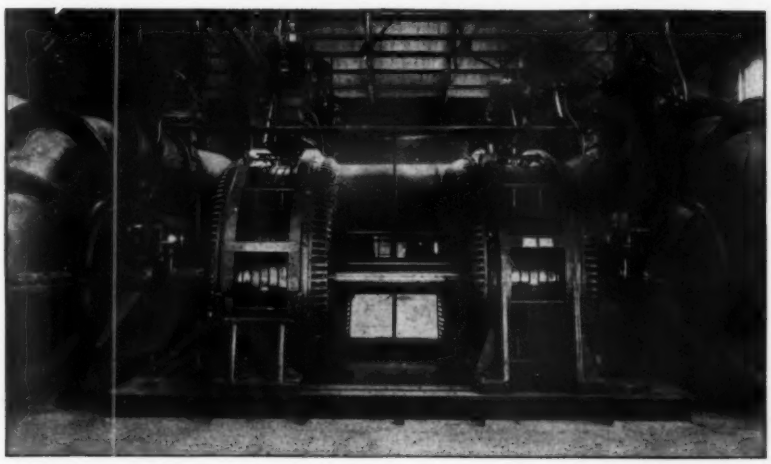
"As this program progresses, consideration will be given to the problem of farm wiring. There is an opportunity to assist the farmer, not only by reducing the cost of installing wiring, but to install it so that it will be of most service. It is believed that simplification of wiring methods will make it possible to reduce costs to a point where farm wiring will consist of more than a few lamp sockets hanging from the ceiling."

Over 3,000 Model Homes Started

More than 3,000 model homes were started on June 15, in observance of National Better Housing Day. These homes are located in over one thousand cities and towns.

Upon completion, they will be open for inspection for a definite period, and then sold. It is expected by the Federal Housing Administration, under whose auspices the campaign is sponsored, that these houses will stimulate home building.

F-M MOTOR DESIGN IS BASED UPON *Users'* EXPERIENCE



F-M synchronous motors serving as pump drivers, frequency changers and synchronous condensers in New Orleans.

Few users of F-M motors ever have occasion to come in contact with the men who actually design the product. But users' problems of starting current, speed, slip, torque, operating conditions and a dozen other factors are constantly reported to F-M design headquarters by our widely-flung field forces. First hand familiarity with actual service conditions in industry, and with the thousands of F-M motors in daily use is responsible for the mechanical excellence of F-M motors.

This background of experience, extending back to the early days of the electric motor, has been responsible for the selection of Fairbanks-Morse to handle such interesting and intricate design problems as that illustrated. This big unit installed by the New Orleans Sewage and Drainage Board contains two 3300 hp. F-M synchronous motors, operating at 13,200 volts, driving two 30-inch Sewage and Trash Pumps. Each set functions as a pumping unit, as a frequency changer to provide a means of interchange of current between the 25-cycle and 60-cycle systems, and as synchronous condensers to float on the line in either system for power factor correction.

F-M Splash-proof Motor

Whatever your customers' requirements or the requirements of your service may be, make it a point to take advantage of this F-M experience before you select. It costs nothing to see what Fairbanks-Morse has to offer. Fairbanks, Morse & Co., 900 S. Wabash Ave., Chicago, Ill. 32 branches at your service throughout the United States.

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Made in Six Sizes

BREEZO Fans make more money for the dealer or contractor because (1) They are all steel—unbreakable. (2) They require practically no servicing. (3) They are quiet and efficient—every one you sell brings you more business. (4) They are ready for stock shipment.

BUFFALO BREEZO VENTILATING FANS

Buffalo Breezo Ventilating Fans are built in six sizes from 12 in. to 36 in. providing a unit for every need. The smaller units are used extensively in residences; the larger sizes are for ventilating factories, garages, theaters, creameries, boiler and engine rooms, etc.

They are sturdily built throughout; the all-steel unbreakable construction of fan, clamps and ring and the totally-enclosed motor with waste-packed bearings requiring lubrication only every 1500 hours.

The improved design of the die-formed steel blades and stream line design of the clamps and ring give these fans a larger capacity than other fans of the same diameter, speed and power consumption. They weigh far less than most other fans of cast iron or even aluminum.

Dimensions

Size in.	Speed r.p.m.	Cap., cu.ft. per min.	Shipping wt., lb.
8	1500	500	6
12	750	460	25
12	1150	700	25
16	850	1100	50
16	1150	1500	50
18	850	1800	60
18	1150	2400	60
24	670	3200	115
24	850	4000	115
30	670	6200	220
36	575	10000	275

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A Roll o' Tape

Electrical Flashes gathered among the big wire and pipe men

by

Electrical Contracting's Field Editors

FIXTURE requirements in Richmond, Va., have been covered by various ordinances which date back over a period of thirty years.

ELECTRIC ranges offer welcome fill-in-business in the opinion of J. T. Flanagan of Flanagan Electric, Inc., Trenton, N. J. The 86 ranges wired by this company in 1934 were carefully handled, so that a journeyman and helper completed such jobs in an average of four hours each.

W. J. GERLOCK, proprietor of the Gervan Electric Co., Bellmore, N. Y., takes pride in being chairman of the electrical licensing board for Hempstead township, Long Island. He feels that the principal cure for many contractor troubles depends upon its own group to cooperatively administer to its well-known ailments.

LONG ISLAND estate owners have curtailed expenses and in so doing the Nelson-Wood Electric Co., Roslyn, N. Y., found some jobs to do as a result of reduced servant staffs. Large private telephone systems are reported to be too complicated for use with a limited household, therefore, the telephone cable systems are in many cases converted for use with bell, buzzer and chime calling systems.

A BIG 75-day job for Watson-Flagg Engineering Co., New York, N. Y., was that of wiring the new French Line Hudson River piers for the new S. S. Normandie. Over 200 electricians were registered for working in shifts not to exceed 27-man hours each per week. Starting work on May 6, about 80 per cent of the job was completed by May 29, to provide permanent lighting and power facilities for docking this new queen of the seas. The unforeseen moving of "shanties" on the job, occurring at the peak of rush operations was estimated to have cost Watson-Flagg about $500 in moving labor and interrupted crew efficiency.

UNUSUAL execution of difficult lighting effects in a Philadelphia club room earned M. E. Arnold and Co. a certificate of award from the local building congress. This neatly framed certificate was presented as "Recognizing and Encouraging Craftsmanship, etc."

A WIRING job that will serve 960 Long Island families is being done by E. A. Kahn & Co., Inc., Jamaica, N. Y. This operation comprises ten 96-family apartment buildings in one group. It is being erected by a limited dividend corporation, formed under the New York State Housing Law.

OIL burner sales are an important share of the annual volume done by Charles Weber, Jr., Whitestone, N. Y., a Long Island contractor who shares his store with a brother who is a heating and plumbing contractor. The combination works out well with numerous other kinds of installations.

PHOTOGRAPHS of interesting motor repair shop practice are valuable selling helps if kept available for everyday use about town, believes J. McMahon of the Atlas Electric Co., Inc., Philadelphia, Pa. Therefore, the sales force of this company carry neat pocket-size leather binders containing choice views that were taken while interesting jobs were on hand.

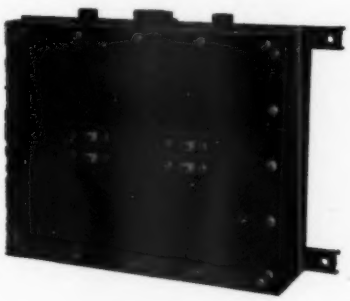
J. R. TOMLINSON of Portland, Ore., secretary of the Portland Chapter N.E.C.A. and until recently over the Portland area NRA, now carries one more card. The State Bureau of Labor has appointed him "electrical inspector" along with J. H. Lake, business manager of Local 48, I.B.E.W. They are to act in matters of interpretation of the new Oregon State Electrical Code. Mr. Tomlinson says that he likes the new cards fine, but that there is no pay attached to the job.

JOHN GIBB, City Electrician of Omaha, Neb., has found a way to make reinspections despite reductions in the department budget. Fifty-two captains of the city fire department make regular general inspections of their districts and submit written reports to the city electrician of all cases which appear electrically unsafe. These reports are then given specific investigation by an electrical inspector. By this system the electrical inspectors avoid needless duplications of calls, and are able to route their work for maximum efficiency.

New Products . for July . . . . .

Dust-Tight Panelboard

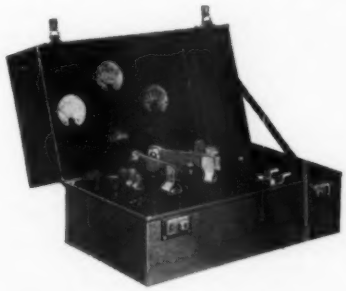
Circuit-breaker, dust-tight panelboards for use in flour and feed mills, grain elevators, starch, sugar and cocoa mills or other Class II, Group G locations. No doors need be opened because each main



or branch circuit breaker is externally-operated. Dust-tight steel cabinets and operating mechanisms are claimed to assure safe operation without danger from arcing. Boxes are one-piece steel, with welded corners, provided with cast iron conduit hubs and welded-on mounting channels. Trims may be removed from the gasketed box flanges for access to the circuit breakers and wiring connections. Benjamin Electric Mfg. Co., Des Plaines, Ill.

Composite Testing Kit

A portable self-contained circuit tester model 3-DA for measuring currents and voltages from 0.5 kw. up to 250 amps., a.c., or 300 amps., d.c., at 600 volts or less. A d.c. instrument has four zero-center scales, which may be shifted by means of a radial



switch in four steps, from 30-0-30 to 300-0-300 amps. An a.c./d.c. three-scale meter registers 0-5 and 0-25 amps., and by means of a built-in current transformer reads 60 cy., a.c., up to 250 amps. An a.c./d.c. four-scale voltmeter reads 0-30 to 0-600 volts, by means of a small rotating scale-changing switch. Further features include: Reversed polarity connection changes are unnecessary on the zero-center instrument; milli-volt deflections may be registered; external shunts or current transformers may be used for values above the capacity of this assembly; the internal resistances of various combinations are given, which makes it possible to evaluate the resistances of armature insulation, etc. The Leonard Electric Mfg. Co., Cleveland, O.

Tumbler Motor Switch

Thermostatic tumbler switches, type "T.T.", for across-the-line starting and overload protection of small motors. Trip-free handles are provided, which cannot be reset for two minutes after overloads have caused the thermal elements to function.

The surface type unit is only 2⅜ in. wide, and 4 in. high. It may also be adapted to standard wall outlets, and cast iron or explosion-proof fittings. Plates are available for flush mounting. Interchangeable time delay heater elements; silver-to-silver switch contacts; bakelite mechanism enclosure; and practically indestructible mechanisms are featured claims. Trumbull Electric Mfg. Co., Plainville, Conn.

Lumiline Lamp Fittings

A line of fittings for installing "Lumiline" lamps on 12-in. or 18-in. centers. Either No. 500 or No. 700 Wiremold may be used with these fittings for installing "line lighting" effects in taverns, stores, etc. Each fit-

ting cover has an opening for inserting a second lampholder back-to-back. Short lengths of connecting molding are intended to be used between fittings. The Wiremold Co., Hartford, Conn.

Trolley Bus System

A system for transmitting current to portable tool motors, which consists of overhead metal ducts containing stationary busses, and traveling carriages or trolleys equipped with collector wheels. This system, known as Trolley Square Duct, pro-

vides mobile circuits for motors that are moved along conveyor and assembly lines and lessens the need for long cords and cables. Other applications are for traveling hoists, machine motors, which are mounted on a traveling bed, or other portable motors for which long cords form an inconvenience or a hazard. The duct is claimed to support at least five trolleys with tools, per 10-ft. section. Special curved sections are available to meet building layouts. Connection boxes for feeders can be attached at any desired point without interfering with the trolleys. Square D Co., Detroit, Mich.

Iron Repair Kit

Kit No. 525 is claimed to contain the essential small parts with which to service all irons and cord sets. A sturdy fibre box contains thirty items, running from

washers to terminals and plug clip. About 547 pieces of assorted service parts are included. Eagle Electric Mfg. Co., Inc., Brooklyn, N. Y.

Oil Burner Control

Three different "off" and "on" periods, plus a fourth "night off" period for apartment house oil burner operations may be pre-selected without the use of a thermostat. A timing device having four cams, and driven by a continuously operated synchronous motor operates a special relay device. A four-position snap switch located on the timing device is set to connect the particular cam that corresponds

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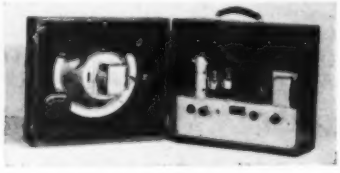
with the desired period of burner operation. This method is claimed to overcome the difficulty experienced where one

or more thermostats are located for temperature setting by various tenants. Struthers Dunn, Inc., Philadelphia, Pa.

Portable PA System

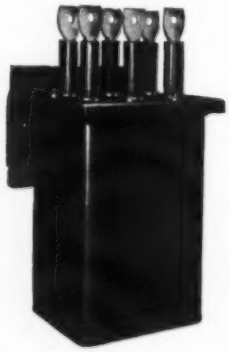
A self-contained portable public address and sound reinforcement system for moderate sized public places, weighing only 28½ lbs. Less than a minute is claimed to be required to put it into operation. De-



signed for plugging into 110-volt, 50-60-cycle power supply, its carrying case has the loudspeaker imbedded in the cover, but it may be separated and suspended from a hook within a 25-ft. radius of the speaker cable. The microphone has a 12-ft. extension cord. Some recommended applications are: Window demonstrations, restaurant order call systems, local fairs and carnivals. RCA Mfg. Co., Inc., Camden, N. J.

Oil Blast Circuit Breaker

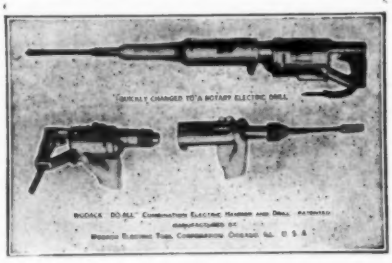
For limited spaces in industrial plants and other stations, the FK-42 oil blast circuit breaker provides a panel mounting, or



metal-enclosed switchgear unit that is rated 600 amps., 7,500 v.; 800 amps., 2,500 v.; and 25,000-kva. interrupting rating. They may be manually or electrically operated. Features of design include: Compactness, silver-to-silver main contacts; oil blast baffles; Herkolite bushings; single tank for all poles made of welded plate steel; internal mechanisms of simple and positive operating design. All designs are double and triple-pole, single throw. General Electric Co., Schenectady, N. Y.

Electric Hammer Drill

A portable "Do-All" combination electric hammer and drill, which is designed to permit quick removal of the hammer attachment for use as a ¾-in. drill, or as a portable grinder or buffer. The hammer



mechanism employs but two working parts, which are made of specially treated steels. It may be used as a hammer with star drills up to 1⅛-in. diameter for drilling holes in concrete or masonry. Special tools can be used for chipping, chiseling or vibrating. Wodack Electric Tool Corp., Chicago, Ill.

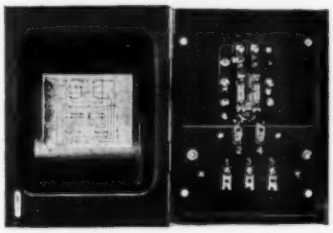
Wire Connectors

"Handi-Lugs" for stud terminals, and "Handi-Two Way" connectors take a range of wire sizes from No. 14 to 1,000,000 C.M. The stud lug is for use on back connected switches and switchboards, any number of

which may be bolted together. The two-way connectors are for joining together of wires. These are claimed to reduce to a minimum the time, effort and material needed in insulating such joints. Trumbull Electric Mfg. Co., Plainville, Conn.

Timing Relay

A thermal relay for use in combination with a magnetic contactor for long-life service in starting one or more compressors in sequence on air conditioning systems. The relay may be calibrated to operate with a delay of a few seconds or several minutes. It is so wired in the contactor circuit as to be cut out as soon as the motor circuit is made, thus permitting the severe inrushes of across-the-line motor starting to be timed in sequence where several motors are operated. Long life under severe conditions, and freedom from



customers' tampering, are claimed, because the relay is completely sealed in a glass tube. Thomas A. Edison, Inc., West Orange, N. J.

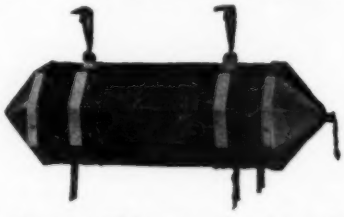
Telephone Battery Eliminator

A compact and noiseless a.c. to d.c. "Powerite" rectifying unit for private telephone systems, which has no moving parts, requires no water or acid, and which is odorless. Its principal compon-

ents are a rectifier, condenser, transformer and choke. It is designed for 110-volt, 60-cycle, a.c. input, and is provided with terminals for 6 volts, d.c., and 6, 12 and 18 volts, a.c. This device is 12 in. high, 8 in. wide and 4 in. deep, weighing 16 lbs. Larger units for 12- and 24-volt d.c. systems are also available. S. H. Couch Company, Inc., North Quincy, Mass.

Sign Transformers

"Windoette" luminous tube transformers employ a silver-veiled octagonal housing and brushed aluminum endplates. This design is offered for exposed installation in



business establishments, since its modern lines are claimed to do away with the need for concealment. Removable secondary cable leads are provided which are rated to be capable of safely supporting skeleton type neon signs weighing up to 100 lbs.

Eye-screws for chain or bracket hanging are supplied. A full range of sizes and characteristics of transformers has been developed. Acme Electric and Mfg. Co., Cleveland, O.

Single Stroke Bell

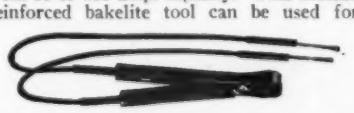
Solenoid type single stroke bells for code calling and fire alarm service in offices, schools, factories, etc. Positive operation, low maintenance costs, and low current consumption are claimed, due to a simplified design which employs a solenoid type plunger as the only moving part. A line of chimes has also been developed which employs similar mechanisms. Benjamin Electric Mfg. Co., Des Plaines, Ill.

Safety Switch

"Dualbreak" type C, 575-volt safety switches employ a sliding switching member which causes each leg of the circuit to be broken at two points. This is claimed to greatly reduce the arc, to provide safer operations and prolonged life. The switch unit is mounted on removable blocks which can be taken out wholly, or in part, for cleaning or replacement of contacts without disturbing the rest of the switch. Other features include a close-hugging handle, front hinged cover and compact cabinet design, all to permit the closer banking of several switches. Colt's Patent Fire Arms Mfg. Co., Hartford, Conn.

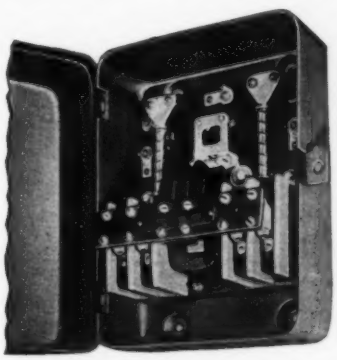
Testing and Fuse Pulling Tool

Combination "Test-Lite and Fuse Fuller" will test circuits of from 110 to 550 volts, and remove or replace fuses from 30 to 100 amp. capacity. This molded reinforced bakelite tool can be used for handling "live" electrical parts, adjusting loose cut-out clips, and "fishing" for loose articles surrounded by live wires. It is 7 in. long and weighs 6 oz. Further features include: 18 in. flexible extension leads equipped with chisel-pointed pins which may be inserted or wedged into switches and cutouts; test light in handle. Ideal Commutator Dresser Co., Sycamore, Ill.



Motor Starter

Magnetic across-the-line starters for squirrel cage and slipring motors. Manual or automatic overload resets are provided for its integral thermal relay. The relay is claimed to be so compensated that wide variations in ambient temperatures do not affect its operating characteristics. Relay ratings are quickly changed by inserting other heater elements of desired capacity. Rugged contractors are furnished with arc barriers claimed to prevent flash-over between phases. Pressed steel and cast iron, dust-tight or watertight enclosures are available for this line. Monitor Controller Co., New York, N. Y.

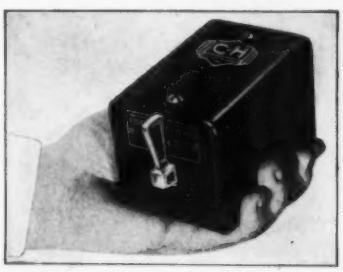


Aluminum Luminaire

The "Trump" line of lighting units, made of "Lunax" aluminum is claimed to retain its brightness and reflecting efficiency, because of a clear, hard protective coating that is provided over a silvery finish. Available in three sizes, for 200, 300 or 500, and 750 to 1,500 watt lamps, with self-aligning stem hanger fittings in the canopy. The stem may easily be shortened on the job without re-threading, while ease of re-lamping and cleaning is claimed by unhooking one of three bowl-supporting arms. Curtis Lighting, Inc., Chicago, Ill.

Small Drum Switch

An across-the-line type reversing switch, Bulletin 9441, type VI, with "twin-break" contacts, for use with a.c. or d.c. motors, with a maximum rating of 2 h.p. at 550 volts, a.c., and a nominal eight hour rating of 15 amps. This device may be used as a three pole, double throw switch by removing jumpers between certain contacts. Design features are claimed to give long wear of arcing parts, and the easy removal of movable contacts without tools. Standard enclosures or skeleton drums with mounting plates for built-in application on machines, are available. Cutler-Hammer, Inc., Milwaukee, Wis.



Indoor Floodlight

A universally adjustable indoor floodlight, furnished with separate bases, for portable mounting, or for permanent screw-down positions. Known as type 670, this unit has a highly polished, 150-200-watt reflector which is claimed to be non-tarnishing. It also includes a color-holder and a set of color screens, porcelain socket, heater cord and plug. Wilson Lighting, Inc., Chicago, Ill.

Color Spotlight

An adjustable beam display spotlight with an automatic rotating color wheel is known as "Golde Rainbo" designed for 400-watt, 110-volt G-30 lamps. It also permits the use of T-500 projection bulbs, or 250-watt G-30 bulbs. The color wheel is equipped with six distinct colors of glass and is operated by a Warren Telechron self-starting synchronous motor. An adjusting thumb screw is used for regulating the size of beam from a concentrated spot to a spread of light, while the rays may be directed from any desired angle with an adjustable bracket. The Golde Mfg. Co., Chicago, Ill.

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There's only one modern way to make wire joints and to economize while doing it—use *thread-on* type IDEAL WIRE CONNECTORS. A twist of the fingers screws connector onto the wires making a joint which is stronger mechanically, better electrically. Uses no solder or tape. Used for every common wiring job.

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ILLINOIS ELECTRIC PORCELAIN CO.
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Trade Notes . .

Henry W. Tideman

Henry W. Tideman, of Menominee, Mich., formerly a vice-president of the Signal Electric Mfg. Co. of that city, died on June 1, at the age of 71 years, after an illness of several years. Mr. Tideman, before his enforced retirement from his company, had been in charge of engineering, and was widely known in the electrical field.

Sherwin-Williams Co., Cleveland, O., has appointed H. J. L. Cotton head of its insulating varnish and compound division.

Steel and Tubes, Inc., announces the appointment of Howard H. Loving as a salesman in the Chicago area for its electric division.

Van Cleef Bros., Chicago, Ill., has appointed Thos. W. Mahoney to have charge of Dutch Branch products sales for the states of Texas, Oklahoma, Arkansas, and Louisiana.

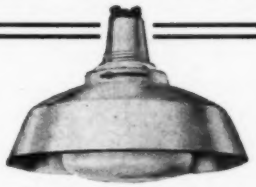
The Mohawk Conduit Co., and the Mohawk Tube Co., are now being operated under the name of the parent company, the Cohoes Rolling Mill Co., of Cohoes, N. Y., which will market the "Mohawk" brand of rigid steel conduit.

Kendall A. Redfield, advertising manager, Rockbestos Products Corporation, New Haven, Conn., has been made assistant general sales manager. Mr. Redfield will continue to supervise the advertising and promotion program of the company.

Electric Storage Battery Co. has appointed Herbert F. Sauer manager of its Chicago branch. Mr. Sauer has been with this company since 1905, and for the past fifteen years he was manager of the Cleveland, O., branch. He has been succeeded at Cleveland by William P. Roche, who began with the company in 1910.

Wilson Lighting, Inc., Chicago, Ill., announces that two new associated companies are being formed to cover different branches of the lighting field. The Wilson Floodlight Mfg. Co., will manufacture a line of porcelain enameled floodlights and gasoline station island lights, while the Wilson Electrical Products Co., will manufacture patented industrial lighting equipment. The parent company management will be in charge of the new companies, under a recently announced expansion to larger factory quarters.

MULTI
INDUSTRIAL FIXTURES



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FEATURE THIS LINE

There is a correct Multi lighting unit for every Factory, Work Shop, and Office Lighting need. In every case the reflectors are not only designed for the most modern lighting results but have special construction features so that they serve efficiently for longest periods. Make money with this line now.

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Jiffy Clip

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Rigid Conduit—⅜"—2½"
Thin Wall—½"—1½"

Jiffy Clip—Rigid Conduit
⅛"—1¼". Also B X Cable

Ask your Jobber

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25 No. Peoria Street, Chicago, Ill.

New York City Branch
381 Fourth Avenue

Manufacturers'

Bulletins . . .

Industrial Reflectors and Floodlights: Bulletin No. 802 illustrates the Appleton line of industrial reflectors and floodlights. Appleton Electric Co., Chicago, Ill.

Residence Fixtures: An 8-page illustrated folder showing a line of residential lighting fixtures. The Art Metal Co., Cleveland, O.

Cable Splices and Accessories: An 80-page book, GEA-1839, illustrates and describes cable splices, joints, terminals, connectors, reservoirs and other materials, as a companion reference to a prior publication GEA-1731, "How to Make Cable Joints." General Electric Co., Schenectady, N. Y.

Circuit Tester: A folder describing model 3-DA Leonard portable circuit tester for industrial use on a.c. or d.c. circuits up to 600 volts, and up to 250 and 300 amps., respectively. The Leonard Electric Mfg. Co., Cleveland, O.

Copper Lugs and Sleeves: Bulletin 528, 8 pages devoted to descriptive information covering Wolverine copper soldering lugs in one, two and four-hole types, made up in standard, center-formed, angle and bell end shapes. Also a complete listing of single and double tube seamless and split-tinned copper splicing sleeves ranging from 4-in. to 24-in. lengths and in sizes to take from No. 18 solid up to 500,000 c.m. stranded conductors. Wolverine Tube Co., Detroit, Mich.

Sports Lighting: A series of nineteen loose-leaf bulletins covering revised lighting layouts, material requirement lists, installation details, and illustrations of outdoor floodlights and reflectors. The series covers: Softball fields, tennis courts, football and athletic fields, football and softball combination fields, baseball fields, swimming pools, trap and skeet shooting, horseshoe pitching, race tracks, putting greens, and putting clocks. Available in complete bound sets with paper cover binder. Benjamin Electric Mfg. Co., Des Plaines, Ill.

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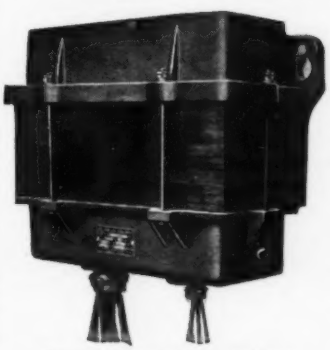
Type CF single-phase, outdoor-type, air-cooled transformer



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AMERTRAN Air-Cooled Transformers reduce operating costs . . . they supply 115-230 volts for lighting or power from 230,- 460,- 575,- or 2,300-volt power circuits so that advantage may be taken of the lower power rates. Other standard types are furnished for phase-changing, voltage boosting, and operating low-voltage equipment.

Type CF units illustrated are of weatherproof construction and are equipped with conduit fittings. They are Underwriters' Laboratories inspected and meet A.I.E.E. standards. Send for price sheet No. 1116 listing sizes from 50 Va. to 150 Kva.

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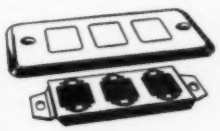

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RIGID GROUND
FITTINGS

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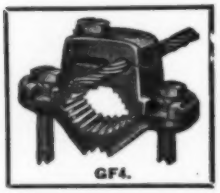
The SHERMAN Rigid Ground Fittings are made to give you perfect conductivity, ease of installation and great flexibility—Can be used with flexible wire, bare wire or rigid conduit. Made for both soldered or solderless installations.


GF4.

GF4

This Fitting is designed for bare or insulated wire handling sizes in range from No. 4 stranded to No. 8 wire. The No. 4 wire need not be bent in assembly as snubbing action of indented groove in assembly assures a tight contact. Bosses on sides of bolt slots for clamping pipe prevent lock washer from slipping out while assembling. Has slotted pipe clamp jaws which are reversible for use with ground rod. Sherman makes a complete line of 6 rigid ground fittings to fill any requirement.

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⅛ to 2"
$5.00

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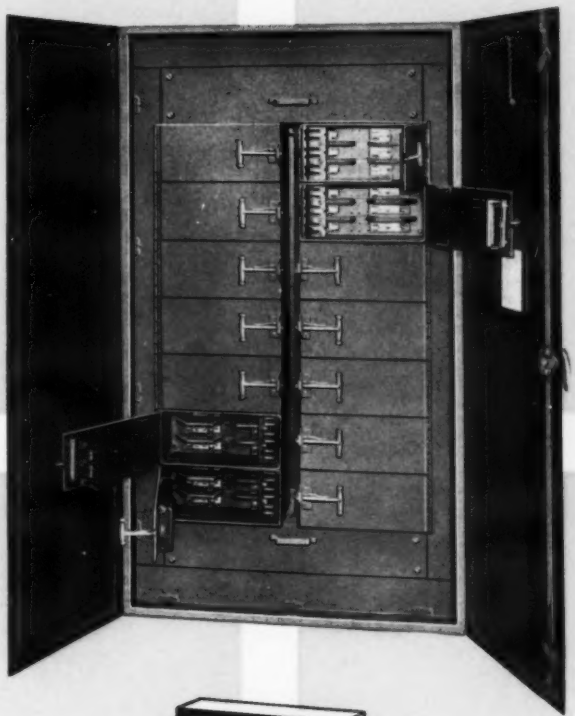
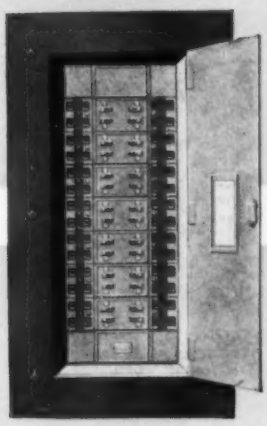
LOOK TO SQUARE D FOR POWER AND LIGHTING PANELBOARDS!

Square D Saflex Panels (center) are excellent in design and appearance. They are designed for both power and light distribution.



Square D Circuit Breaker Panels (extreme left) and Square D Fuse Lighting Panels (below) are also noted for their fine design, appearance and construction.



■ Long and favorably known as the original and largest manufacturers of safety switches, the Square D Company also enjoys an enviable reputation in the field for the manufacture of power and lighting distribution panels.

The three panelboards illustrated herewith are typical of the Square D line.

The Saflex panel, illustrated in the center, is conspicuous for its fine appearance and the excellence of its design. It is designed for both power and lighting distribution, is rated in horsepower, has exceptional overload rupturing capacity and may be used as a motor circuit switch.

The Fuse Lighting Panel, illustrated at the right, is also intended for both power and lighting as the switches are rated at full 30 amperes and can be safely used for small motors. Its appearance and design are also worthy of your consideration. It is designed for 30 ampere circuits.

The Circuit Breaker Panel, illustrated at the left, is a power and lighting panel. It is well designed and, like the Saflex panel, is interchangeable so that circuits of different sizes may be used in capacities from 15 to 50 amperes.

These three panelboards are representative of the entire Square D line and when used with SQUARE-Duct provide a power and lighting distribution system of great flexibility, high efficiency, long life and moderate installation cost.

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